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ABSTRACT

This document comprises seven manuals that update and supersede a field review edition previously cited under ED 057 751. The first manual, an overview of the complete set, discusses the facilities planning cycle and the possible effects of currently changing instruction techniques on the facilities planning processes. The next four manuals present procedures for evaluating and projecting various space type requirements: manual 2--the techniques for evaluating the capacities of and projecting the requirements for classroom and class laboratory facilities; manual 3--some similar procedures for office and research facilities; manual 4--the procedures to determine academic support facility needs (i.e., library, audiovisual, exhibition, and computer facilities); and manual 5--other major types of general support facilities (i.e., athletic/physical education, recreation, lounges, residential, dining halls, and student health facilities). Manual 6 describes the detailed program planning and analysis procedures that yield the inputs for the facilities planning process and proposes systemwide facilities planning criteria appropriate for statewide or system-level output evaluation. Manual 7 contains the glossary, a bibliography, an index, and the table of contents for each manual. (Author)

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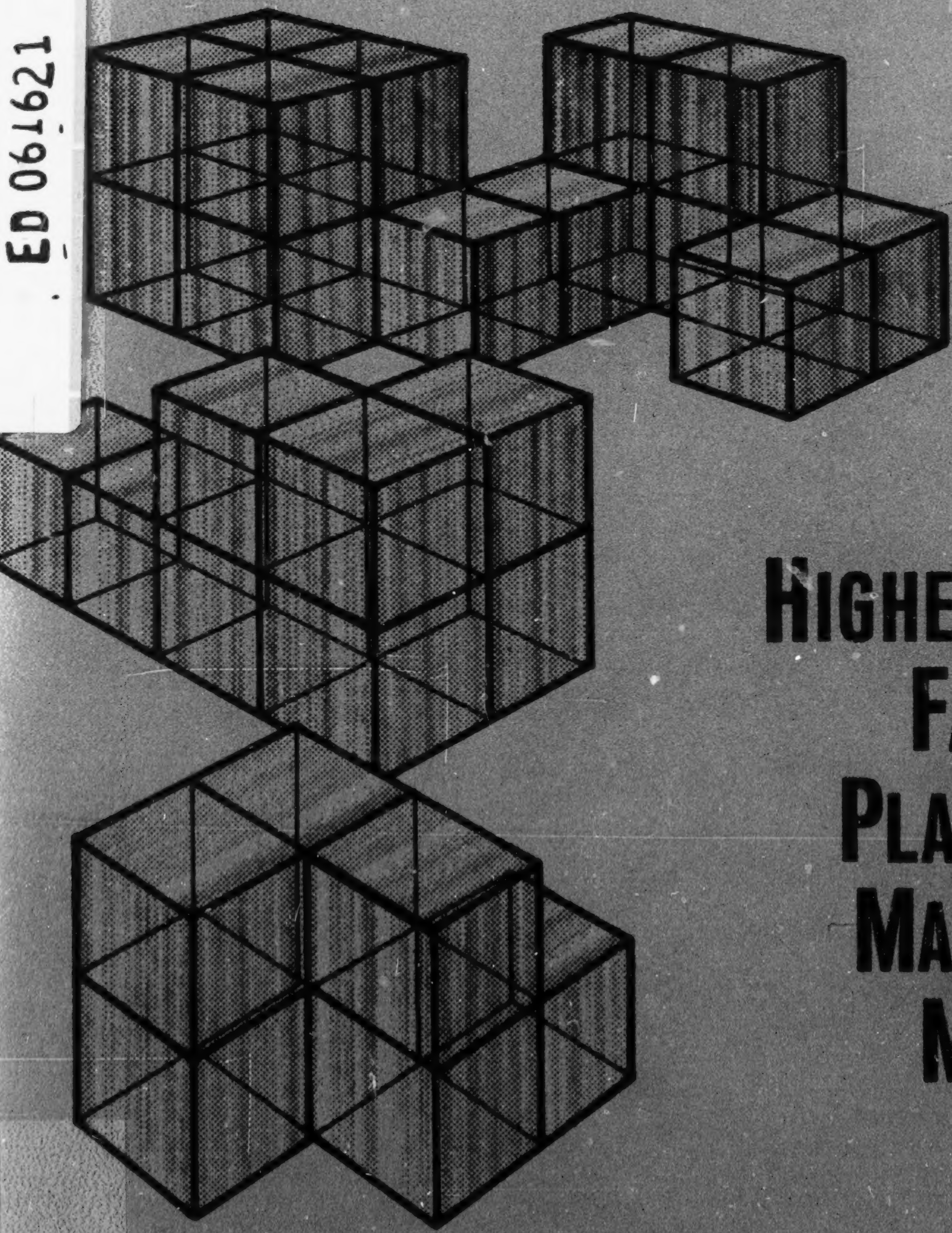

HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

EA 004 224

PLANNING AND MANAGEMENT SYSTEMS DIVISION
WESTERN INTERSTATE COMMISSION FOR HIGHER EDUCATION

in cooperation with

THE AMERICAN ASSOCIATION OF COLLEGIATE REGISTRARS AND ADMISSIONS OFFICERS

ED 061622

HIGHER EDUCATION
FACILITIES
PLANNING AND
MANAGEMENT
MANUALS

manual one

Higher Education Facilities Planning and Management: An Overview

PLANNING AND MANAGEMENT SYSTEMS DIVISION
WESTERN INTERSTATE COMMISSION FOR HIGHER EDUCATION

in cooperation with

THE AMERICAN ASSOCIATION OF COLLEGIATE REGISTRARS AND ADMISSIONS OFFICERS

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. . . to increase educational opportunities for westerners.

. . . to expand the supply of specialized manpower in the West.

. . . to help universities and colleges improve both their programs and their management.

. . . to inform the public about the needs of higher education.

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To design, develop, and encourage the implementation of management information systems and data bases including common data elements in institutions and agencies of higher education that will:

- provide improved information to higher education administration at all levels.
- facilitate exchange of comparable data among institutions.
- facilitate reporting of comparable information at the state and national levels.

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

MANUAL ONE

HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT: AN OVERVIEW

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Technical Report 17-1

Planning and Management Systems Division
Western Interstate Commission for Higher Education
Boulder, Colorado

In cooperation with the
American Association of Collegiate Registrars and Admissions Officers

May 1971

PREFACE

This edition of the *Higher Education Facilities Planning and Management Manuals* represents an extensive revision of the Field Review Edition published in November 1970. The response to that earlier review draft was both gratifying and constructively critical, and the authors and their advisors have made several major changes in organization and content. **USERS ARE URGED TO DISCARD COPIES OF THE FIELD REVIEW EDITION.**

The format of this edition—composed of seven separate manuals in a looseleaf binder—is designed to allow for separate use of the manuals, future amendments of particular manuals, and the addition of supplementary materials. For example, a revision of the *Higher Education Facilities Classification and Inventory Procedures Manual,* published by the Office of Education in 1968, will be made in 1971-72 by the WICHE Planning and Management Systems program under contract to the National Center for Educational Statistics. These revisions will affect the facilities planning and management manuals throughout, and the revised classification and inventory manual can be added to this binder or used separately.

The application and modification of the methods described in these manuals by colleges and universities over the next few years are expected to yield many suggestions for future changes and additional materials. Users are urged to communicate their ideas and suggestions to:

The Western Interstate Commission for Higher Education
National Center for Higher Education Management Systems at WICHE
P. O. Drawer P
Boulder, Colorado 80302

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Section 1.

INTRODUCTION

INTRODUCTORY COMMENTS

Manual One of the *Higher Education Facilities Planning and Management Manuals* is designed to provide the reader with an overview of the techniques and methods which are presented in the ensuing documents.

Section 2. describes the context into which these manuals are intended to fit as well as the historical development in the area of facilities planning which preceded the funding of this project.

Section 3. presents the fundamental principles and assumptions which guided the authors in their preparation of the material. The general context, structure, and use of the manuals are presented in Section 4.

Of major interest to the reader should be the role of these manuals in the total cycle of facilities planning. This topic is the subject of Section 4., entitled "The Facilities Planning Cycle." The total process is described and then those aspects of the process which are covered by the manuals are pointed out.

There are institutions in the country which are beginning to offer programs and use instructional techniques which may require substantive modification of the normal methods of projecting and evaluating facilities. The experiences at one such institution, Colorado College, are discussed in Section 5. of Manual One.

ACKNOWLEDGMENTS

The *Higher Education Facilities Planning and Management Manuals* are the product of the composite efforts of many individuals. In particular, the contributions of the members of Space Analysis Manuals project Task Force* and Advisory Review Panel have been of exceptional value. Members of both panels have given generously of their time and intellect to the sometimes tedious task of reviewing the work of the authors.

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***Members of the task force are designated with an asterisk.**

We are particularly obliged to Harlan Bareither (University of Illinois) and Donovan Smith (University of California) for their assistance with those sections dealing with Systemwide Facilities Planning Criteria and Unit Floor Area Criteria. Moreover, Donovan Smith must be especially credited for his meticulous editing, never losing sight of the essence of the manuals. We express our apologies to him, for we have not always been faithful to his principles of grammar and punctuation.

William J. Martin (Texas College and University System), Edward Rodgers (California Community College System), Mark Meredith (University of Colorado), and Rima Bostick (State University of New York) have been especially helpful in reading and reviewing the content of the manuals as well as providing perspectives which otherwise might have been omitted.

Dr. Adolph Koenig and Dr. Chester A. Neudling (Office of Education) both were especially helpful in advising the authors of the relationship of the manuals to federal needs and in guiding them through the intricacies of the project grant.

A special expression of appreciation should be extended to the American Association of Collegiate Registrars and Admissions Officers for their co-sponsorship of the project.

Ben Lawrence, Nancy Eklund, Warren W. Gulko, Robert A. Huff, and James S. Martin of the WICHE Planning and Management Systems Division have helped to assure compatibility between the Space Analysis Manuals project and the other WICHE Planning and Management Systems projects.

Finally, the efforts of all of the above would have been in vain were it not for the enduring patience and skilled efforts of the WICHE Planning and Management Systems secretarial staff, especially Delma Oberbeck.

Section 2.

BACKGROUND

The expanding demands for the services provided by institutions of higher education have resulted in massive increases in physical plant investment during the past two decades. As the cost of providing facilities has become more burdensome, the need for more effective planning and utilization of these facilities has become a major concern not only of institutional administrators but also of those who are called upon to provide the capital funds. One outcome of these concerns has been a requirement for increasingly explicit justification of proposals for the reallocation of existing space as well as for the construction of additional space.

The process by which capital resources are allocated more and more is becoming dependent on quantitative evaluation of existing capacity and on carefully documented projections of future needs. In many instances, however, college administrators do not have the tools that allow them to respond effectively to these emerging requirements. Although a wide variety of such tools have been developed and applied in a few institutions and by some statewide coordinating bodies, there is no single, comprehensive document which describes consistent sets of methods for evaluating the capacity of existing college and university facilities and for projecting future facilities requirements. The objective of these manuals is to present a reference work which speaks to this need.

The measurement and improvement of the utilization of college facilities historically have been of concern to institutional administrators. A long series of formalized studies and publications dealing with the subject dates from the 1920s. Widespread interest in these studies, however, did not materialize until facilities shortages became critical in the years immediately following World War II.

At that time the American Association of Collegiate Registrars and Admissions Officers (AACRAO) sponsored the first of its many major contributions to the projection and evaluation of facilities needs. The first of these projects emphasized the magnitude of the post-war enrollment growth (*College Age Population Trends, 1940-1970*, published in 1953; and *The Impending Tidal Wave of Students*, published in 1954).

Because the college registrar was generally responsible for the assignment and scheduling of instructional space, AACRAO subsequently turned its attention to sponsoring projects dealing with improved management of the available facilities. In 1957 the Association sponsored and published the *Manual for Studies of Space Utilization in College and Universities* by John Dale Russell and James I. Doi. A follow-up to this manual, also sponsored by AACRAO, included the compilation of instructional space utilization studies by James I. Doi and Keith L. Scott, published in 1960 as *Normative Data in the Utilization of Instructional Space in Colleges and Universities.* These publications (now out of print) have been widely used in the United States and abroad as the basis for evaluating the current utilization of classrooms and class laboratories.

The search for better ways of utilizing existing facilities, determining facilities needs, and justifying additional facilities of all types became a matter of considerable interest to some institutions and state agencies in the early and middle 1950s. Donovan Smith's pioneering research at the University of California, published under the title, "College and University Space Requirements," in the 1954-55 editon of *American School and University,* was the basis of widely influential planning criteria in the *Restudy of the*

Needs of California in Higher Education (1955) and of the facilities section of the *California and Western Conference Cost and Statistical Study* (1954-55 data, published in 1960 by the Ford Foundation's Fund for the Advancement of Education). In 1958 the University of Minnesota published William T. Middlebrook's *How to Estimate the Building Needs of a College or University*. These major contributions to the literature expanded the methodologies and criteria for evaluating not only the current use of existing classroom and class laboratory facilities, but for the entire range of facilities required by a college or university. This development was recently continued by the University of Illinois' publication in 1968 of the work of Harlan D. Bareither and Jerry L. Schillinger, *University Space Planning*.

At the national level, the first comprehensive data on the scope and nature of higher education facilities was obtained by the U. S. Office of Education in 1957-58 through a nationwide inventory of building facilities. The data compiled in that study provided the basis for estimating the nation's future needs for higher education facilities and helped to lay the foundations for the passage of the Higher Education Facilities Act of 1963. This act provided federal monies for the construction of college facilities. It also required the creation of state commissions to manage the distribution of these funds. In addition the Higher Education Facilities Act provided funds to these state commissions for improving comprehensive statewide planning of higher education facilities requirements. As a result of the various provisions of this act, the machinery was created for establishing a coordinated state-federal system for gathering information pertinent to the evaluation of facilities needs.

The inauguration of the Higher Education General Information Survey by the U. S. Office of Education in 1966 reflected the growing need for consistent and comprehensive data on the whole range of higher education activities. As a result of the needs for both general higher education information and the more specific facilities information required for operation of programs for the construction of higher education facilities, the National Center for Educational Statistics (NCES) and the Bureau of Higher Education, Division of College Facilities (DCF), jointly sponsored the preparation of the *Higher Education Facilities Classification and Inventory Procedures Manual* (OE 25106, 1968). Additional support was provided by the Higher Education Facilities Planning Office of the New York State Education Department. This manual was developed primarily through the efforts of Harold Dahnke of Michigan State University, Donovan Smith of the University of California, and John Cleek of the Oklahoma Board of Regents. Chalmers G. Norris of the Division of College Facilities, Theodore Drews of the National Center for Educational Statistics, and William S. Fuller of the New York State Education Department also gave major support to the project. It has gained widespread acceptance at all levels of the higher education community and has served as the basis for gathering data needed by state and federal agencies, as well as that pertinent to institutional administration. In particular, facilities data structured in accordance with the classification schemes presented in the manual have been gathered annually by NCES since 1968.

The Space Analysis Manuals project was initiated by the American Association of Collegiate Registrars and Admissions Officers with the limited objective of updating the Russell-Doi space utilization manual. Prior to receipt of funding from the Office of Education, Bureau of Research, in 1969, the project was merged into the Planning and Management Systems Program of the Western Interstate Commission for Higher Education. The integration of the Space Analysis Manuals project with the WICHE-PMS program was designed to insure that the terms, definitions, and analytical concepts utilized in the facilities manual would correspond as closely as possible to those being developed in the WICHE-PMS program. As a result of the incorporation of this project into the PMS program, its scope has been expanded to include evaluation and planning methodologies pertinent to all kinds of college and university facilities for which such methodologies are appropriate and available.

Section 3.

Overview of the Manuals

PHILOSOPHY AND ASSUMPTIONS

Throughout the development of these manuals it has been intended that the primary audience will be composed of individuals who are responsible for planning but who are not necessarily experienced specialists in facilities planning and management. Further, it has been supposed that this primary audience will be found principally in new and/or smaller four-year institutions, both public and private, and in the community colleges.* Although primarily directed to this particular audience, the manuals are expected to be useful to the more experienced facilities planners in the larger institutions as well.

Several assumptions have guided the development of these manuals. First, the manuals are designed specifically to address those aspects of facilities planning which occur at the institutional level. With the exception of one section, the manuals are directed to the institutional user. (In Section 3. of Manual Six an approach to systemwide or statewide planning criteria is proposed.) This institutional orientation derives from a conviction that the existing diversity in American higher education is healthy and should be sustained and nurtured. None of the procedures discussed is so rigid as to enforce homogeneity or to preclude a place for institutional individuality. On the contrary, wherever appropriate the procedures explicitly call for the input of factors and considerations which represent statements of institutional policy.

Second, some of the procedures are presented and illustrated in great detail. Many different factors combine to affect the facilities requirements and must be considered in the planning process, especially with regard to classroom and class laboratory facilities. The relationships between these factors in many cases are very subtle. As a result, the procedures to be followed in planning such facilities have been described at great length in an effort to enhance the planner's understanding of the basic relationships. Where these relationships are less complex, the procedures are described in more generalized terms.

Third, it is recognized that many institutions do not have computer capability or extensive data files in a form suitable for electronic processing. As a result, care has been taken to insure that a computer capability is not required in order to use the procedures. Rather, the development of the procedures has been governed by a requirement that they be capable of application using nothing more than a pencil, some paper, and a calculator. While efficient operation calls for use of a computer when applying these procedures at a large institution, there is nothing about the procedures themselves which makes the availability of a computer a basic requirement for their use.

Fourth, since collection and manipulation of input data is an expensive and time-consuming undertaking, wherever possible the procedures are designed to use those data typically collected and maintained. Admittedly, some of the procedures call for data which are not ordinarily in an institution's data system. Hopefully, such occurrences have been kept to a minimum. Effective use of the manuals, however, implies that if the necessary data are not readily available, steps should be taken to include them in the data system.

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*It is recognized that some of the terminology used in these manuals is not typically used in the community colleges. In such situations the context of the unfamiliar terms should provide a sufficient basis for substitution of terminology more appropriate to community colleges.

Fifth, the content and tone of these manuals have been shaped by the authors' strongly held conviction that facilities planning *must* be viewed in the broader context of a total planning and management system. Reference is made throughout the manuals to the fact that facilities planning, which will reflect the future needs of the institution faithfully, can be accomplished only as a integral part of the assessment of the resources necessary to accomplish the educational objectives of the institution.

Sixth, these manuals originally were intended to be restricted to the presentation of facilities planning and management methodologies. However, because effective planning and management of facilities is based upon educational program parameters and because materials describing the techniques of program planning have not yet been developed, a rather detailed discussion of program planning and analysis techniques is included in Manual Six. Other projects currently in progress within the WICHE Planning and Management Systems Division are designed to provide the program planning base fundamental to the use of the facilities planning procedures presented here. The program planning and analysis techniques described in Manual Six are intended only to serve as substitutes until these projects are completed. An effort has been made to adapt the facilities planning procedures to the anticipated forms of the WICHE-PMS products. The terms, definitions, and analytic concepts in the manuals follow these in the WICHE-PMS *Program Classification Structure* (Preliminary Edition, June 1970), the *Data Elements Dictionaries* (First Edition, April 1970), and the Resource Requirements Prediction Model-I (Version Two). In turn, the Space Analysis Manuals project staff has contributed heavily to the development of those products. In all probability, some of the procedures in these manuals will require change as a result of future developments in those projects. It is expected that the changes will be minimal.

Finally, the content of these manuals has been influenced strongly by an assumption that they can be of maximum use if the procedures deal with the problems as they are recognized currently rather than as they *may* develop in the future. As a result, these manuals are largely a compilation of the existing state of the art. The methodologies presented reflect the more traditional forms of education and the conventional measures of educational activity (e.g., Student Credit Hours and Weekly Student Hours).

Movement away from the traditional forms and measures of education is abundantly evident now and undoubtedly will continue at a quickening pace. Such variations as greater use of independent study, computer-assisted instruction, pass-fail grading, and elimination of prescribed courses have become commonplace. Nevertheless, the bulk of the institutions in which this document should find its greatest utility have not yet broken sharply with the past and probably will not do so in the foreseeable future. By directing these manuals to the users' existing problems, it is hoped that the transition, when it comes, may be made easier by an improved understanding of those problems.

In an effort to show how these procedures may have to be modified because of significantly altered instructional techniques, Section 5. of Manual One describes the effects of a markedly different form of curricular organization on the use of space and the projection of facilities requirements. The section also serves to emphasize the importance of aesthetic considerations and the quality of the academic environment. While there are no generally accepted techniques for measuring quality or appropriateness of the environment, attempts to develop such techniques have been made.* Since considerations of quality are subject to individual perception, and since there are as yet no concrete guides for measuring the quality of space or its functional

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*For example, the Forward Planning Section, Bureau of Capital Development, State of Wisconsin, has developed a systematic approach to the quantitative evaluation of facilities quality and obsolescence from the standpoint of structure and function.

adequacy, discussion of these subjects has been omitted from these manuals. This in no way implies that such considerations are of no consequence. Rather, it recognizes that decisions regarding them are strictly subjective judgments which must be made at the institutional level with the advice and assistance of qualified experts.

Section 3.1.

Overview of the Manuals

STRUCTURE AND CONTENT

The *Higher Education Facilities Planning and Management Manuals* consist of seven separately bound volumes. Manual One, designed to present an overview of the complete set, includes an introductory discussion of the facilities planning cycle and an essay on the possible effects of changing instruction techniques on the facilities planning processes.

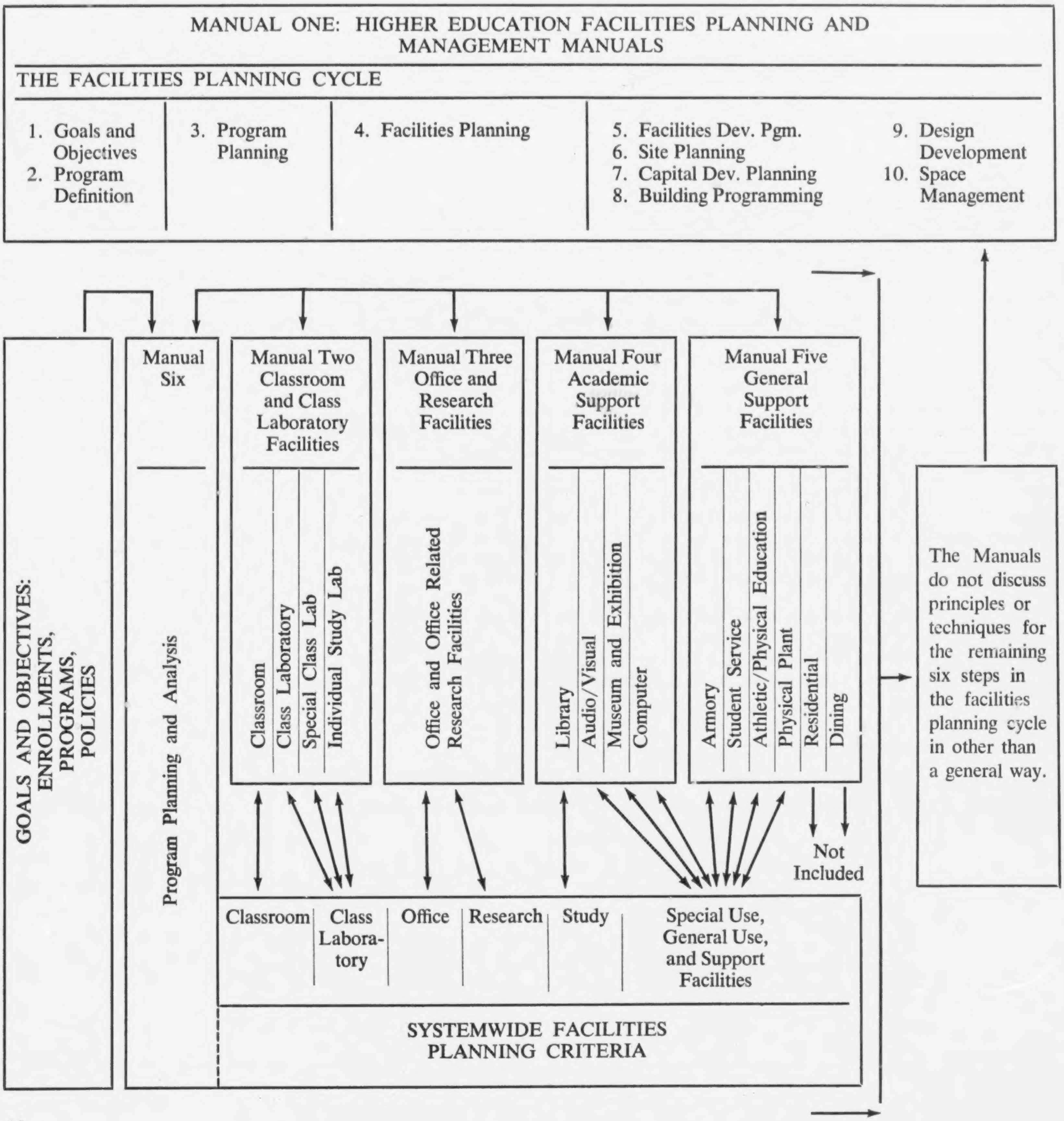
Manuals Two through Five contain the presentation of the procedures for evaluating and projecting the requirements for the various space types. These four manuals could have been organized in a variety of ways. Organization of the manuals by space type (with the added dimension of organizational unit where appropriate) was chosen because this structure was found to be best suited to the presentation of the material. Manual Two describes the techniques for evaluating the capacities and projecting the requirements for classroom and class laboratory facilities. Manual Three suggests similar procedures for office and research facilities. Manual Four analyzes procedures for determining needs for academic support facilities (i.e., library, audio/visual, exhibition, and computer facilities). Manual Five discusses other major types of general support facilities (e.g., athletic/physical education facilities, recreation facilities, lounges, residential facilities, dining halls, and student health facilities). It should be noted that medical care facilities (i.e., medical, dental, and veterinary medicine clinical and hospital facilities) are not discussed in the manuals.

Manual Six contains a description of the detailed program planning and analysis procedures which yield the inputs for the facilities planning process. This manual also includes a proposal for systemwide facilities planning criteria appropriate for statewide or system-level evaluation of the outputs of institutional facilities planning systems. The data requirements for program planning at the institutional level and those required for the proposed approach to systemwide planning criteria are included as part of each of the discussions.

Manual Seven contains the general reference material pertinent to the complete set of manuals: Glossary, Bibliography, Index, and Table of Contents for all seven documents.

The diagram below illustrates the functional relationships of the manuals in the context of the overall facilities planning process.

FUNCTIONAL RELATIONSHIPS OF THE MANUALS


MANUAL ONE: HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS
THE FACILITIES PLANNING CYCLE
1. Goals and Objectives
2. Program Definition
3. Program Planning
4. Facilities Planning
5. Facilities Dev. Pgm.
6. Site Planning
7. Capital Dev. Planning
8. Building Programming
9. Design Development
10. Space Management
GOALS AND OBJECTIVES: ENROLLMENTS, PROGRAMS, POLICIES
Manual Six
Program Planning and Analysis
Manual Two Classroom and Class Laboratory Facilities
Classroom
Class Laboratory
Special Class Lab
Individual Study Lab
Manual Three Office and Research Facilities
Office and Office Related Research Facilities
Manual Four Academic Support Facilities
Library
Audio/Visual
Museum and Exhibition
Computer
Manual Five General Support Facilities
Armory
Student Service
Athletic/Physical Education
Physical Plant
Residential
Dining
Not Included
Classroom
Class Labora-tory
Office
Research
Study
Special Use, General Use, and Support Facilities
SYSTEMWIDE FACILITIES PLANNING CRITERIA
The Manuals do not discuss principles or techniques for the remaining six steps in the facilities planning cycle in other than a general way.

Section 3.2.

Overview of the Manuals

ORGANIZATION

A generally consistent structure has been adhered to in presenting the facilities planning procedures for each of the various space types (Manuals Two through Five). For each space type, two sets of procedures are discussed; one deals with evaluating the capacity of existing facilities, the other describes the techniques to be used in projecting future requirements for that particular type of space. Where potentially beneficial to the user, the projection methods for a new institution and those more relevant to an existing institution are presented separately.

A basic pattern has been followed in presenting the techniques for evaluating capacities of existing facilities and projecting future requirements. Common to this pattern are the following topics:

FACILITIES DATA REQUIRED

A listing of the information about existing facilities which must be available before the user can use the procedures.

PROGRAM DATA REQUIRED

A listing of the information regarding courses, students, program loads, and other data which must be available before the procedures can be used. The Program Planning section of Manual Six is addressed specifically to the techniques for projecting program data.

UTILIZATION ASSUMPTIONS REQUIRED

A listing of various assumptions regarding utilization or occupancy rates which must be expressed quantitatively prior to application of the methodologies is included. These assumptions represent the mechanism by which necessary institutional variations are accommodated.

PROCEDURES

A step-by-step explanation of the procedures followed in evaluating current capacity or projecting future requirements for each type of space is given.

EXAMPLE

A numerical example is included where appropriate to better illustrate the procedures.

DISCUSSION AND COMMENTS

Wherever appropriate, special problems or variations which can occur are discussed.

UNIT FLOOR AREA CRITERIA

Ranges of values of illustrative unit floor area criteria (Assignable Square Feet per unit of space demand) are presented for all types of space for which they are appropriate.

In summary, the manuals are designed to tell the users what data must be available before a start is made; the procedures to be followed in using the data for evaluative or projective purposes; and, in addition, give illustrative values of unit floor areas which the user can employ as criteria in the absence of values directly applicable at his particular institution.

This structure, of course, cannot be followed where no generally satisfactory planning procedures are available. In such cases, a general discussion of the problems associated with the planning of such facilities is provided.

Finally, the structure recognizes different levels of detail (two levels in most cases). For each space type a very detailed set of procedures for evaluating capacities and projecting requirements is discussed. In addition, a more generalized, "rule-of-thumb" set of procedures requiring data which are less detailed is presented also. In each case, the detailed procedures require input data which reflect the individual institution's characteristics. The general methods are less sensitive to institutional variation and should be based on prior use of the more detailed methods if they are to be used for a given institution with any degree of confidence in their validity.

Section 3.3.

Overview of the Manuals

USE

These manuals constitute a handbook of facilities planning methodologies. As handbooks, they include a wide range of facilities planning techniques from which the institutional planner should select those appropriate to his particular needs. Initially, the user should skim all the material in order to grasp its breadth and depth. Seldom, if ever, will the entire range of subject matter be of concern to the user at one time. In using the manuals, the user should search out those sections which apply specifically to his particular problem of the moment and then use only the limited amount of material of immediate concern.

Since these manuals are intended to be used as handbooks, there is a certain amount of deliberate redundancy to make the material of maximum benefit with a minimum effort required of the reader for cross-referencing.

The user should take particular heed of the following caveats:

> These manuals are handbooks of selected techniques and procedures. They are not exhaustive, **nor are they to be construed as recommending planning standards** for any individual institution or any group of institutions. The quantitative values of such criteria as utilization rates and unit floor areas in the examples are intended only to illustrate the calculations. No user should borrow either those numbers or the separately tabulated ranges without a great deal of review and analysis of his own institution's characteristics, programs, and plans.
>
> The user should develop a healthy skepticism toward the procedures as well as the quantitative information. The methodologies presented, especially the generalized methods, may be inappropriate for use because of some unique characteristic of a particular institution. As shop-worn as the warning may seem, the user should convince himself that the procedures are, in fact, appropriate for use in his particular situation before he applies them. In addition, these procedures generally reflect the current state of the art. Institutional planners should not hesitate to deviate from these procedures as changing conditions and requirements dictate. The user should realize also that these techniques are confined to the quantitative aspects of the evaluation and projection processes. The all-important qualitative evaluations and decisions rest solely on the subjective judgment of the user and the policy-making agencies of his institution.
>
> Above all, the user should keep facilities planning in perspective and in its proper context. Facilities planning should be recognized as an outgrowth of academic and support program planning; the procedures associated with program planning should be undertaken prior to use of the facilities planning procedures.

In summary, these manuals should not be viewed as the "books with all the answers." It is impossible to write a document which considers all the special cases and all the unique reasons for interinstitutional variations. At best, the manuals present materials which should be of some use to some of the users some of the time. The manuals can serve as a guide and as an aid, but they cannot serve as a substitute for intelligence, knowledge, and experience. They cannot do the institutional planner's job for him, but, hopefully, they can make his job easier.

Section 4.

The Facilities Planning Cycle

INTRODUCTION

College building facilities should be built as the result of a rational and ordered planning process. Proceeding from the institutional purposes—traditionally and broadly stated as instruction, research, and public service—it should be possible to develop specifications of the academic programs* for which a new building will provide a physical home. A detailed set of program specifications should yield information concerning students, faculty, and the activities in which they engage (both formal and informal) and the relationships of these activities to the facilities required to house them. This program description can be converted into an expression of required building space after it is evaluated and adjusted to accommodate anticipated program changes, shifts in the relative proportions of student loads at various course levels, changing student-staff ratios, and similar modifications over the course of time.

To this statement of space requirements several other pieces of information must be added: the functional relationship of one space to the other, design criteria for the various kinds of space, and detailed room-by-room specifications. After these program specifications are translated into a building-program statement and after a site is selected, the institution, usually with the assistance of the project architect, prepares a project budget.

During the process of developing building programs, schematic plans, preliminary plans, working drawings, and cost estimates, the institutional representatives and the architect interact again and again until actual bids are received for construction of the facility. Sometimes bids in excess of the budget cause the whole planning process to revert to some earlier stage for revision—occasionally back to the very beginning. With the occupancy of the building, possibly several years later, the efficacy of the whole planning process is tested. Whether or not the planning proves to have been effective, it is likely that sooner or later a series of alterations to the building begin which continue from time to time throughout its lifetime.

Such is the rational, orderly process by which college and university buildings should be built. Many of them, perhaps most of them, are not. These manuals do not pretend to explain each aspect of this rational, orderly process. Rather, they treat those facets which are typical across the entire spectrum of institutional types: procedures for program planning, evaluation of capacity, and projection of needs. However, there is a need to describe the context in which the procedures of these manuals are designed to operate. A thorough understanding of this context and the assignment of facilities planning to a role supportive of the pursuit of an institution's long-range goals and objectives are requisite to the successful application of the various procedures.

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*Recognizing that the term "program" often conveys very specialized meanings, it will be used here to mean a detailed description of the collection of activities (instruction, research, public service, and supporting program activities) to be accommodated and the resources (personnel, equipment, etc.) required to carry out these activities.

The facilities planning cycle is divided into two segments. The first segment focuses attention on the four basic dimensions of the "comprehensive planning" process:

- ►Formulation of an institution's goals and objectives
- ►Anticipation of academic program development and levels of activity required to meet these goals and objectives
- ►Estimation of the facilities resources required by the projected academic programs and levels of operation
- ►Preparation of a facilities-development program, a long-range campus site plan, and a capital-funding program

The second segment focuses on the processes of program implementation and facilities management:

- ►Building programming
- ►Design development
- ►Space management

While the elements of these two segments are separated for discussion purposes, in reality they are intricately interrelated facets of a single process.

The processes of planning and implementation go hand in hand. To plan without having the implementation of the plans as an ultimate objective renders planning a pointless exercise. To implement without benefit of the direction provided by program planning is at best inefficient. It is in the process of implementation that refinements, revisions, and updating of plans occur; thus, implementation serves to make program planning a meaningful, continuous process.

The indicated steps in the facilities planning cycle are as follows:

STEPS IN THE FACILITIES PLANNING CYCLE

• Statement of conditions sought • Qualitative • Identify specific functional areas of endeavor	**Goals**
• Specific ends to be achieved in the functional areas • Quantitative	**Objectives**
• Development of a proposed set of courses of action by which the desired ends can be achieved • Planning assumptions	**Program Definition**
• Estimation of the program loads and the resources required to implement the courses of action	**Program Planning**
• Determination of the facilities resource requirements by organizational unit and type of space	**Facilities Planning**
• Grouping of facilities needs into identifiable building units (both existing and new)	**Facilities Development Program**
• Revision of the campus map to reflect appearance of new facilities and disappearance of those scheduled for demolition	**Site Planning**

Capital Development Planning	• Establishment of priorities for building and remodeling projects and estimation of project costs
Building Programming	• Describes a proposed building or remodeling project in terms of detailed facility requirements
Design Development	• Development of a detailed set of building plans
Space Management	• Allocation of facilities resources to departments and programs and the continuous monitoring of these allocations

Section 4.1.

The Facilities Planning Cycle

THE PROCESS OF COMPREHENSIVE PLANNING

DISCUSSION

The term "comprehensive plan" is used here to connote a statement of institutional goals and objectives, of the expected nature and timing of institutional development, and of the estimated manpower, fiscal, and facilities resources required to attain the stated institutional goals and objectives.

Some form of comprehensive plan is required by most state governments and many foundations as a prerequisite to the appropriation of capital funds. Increasingly, the funding agencies are defining the elements to be included in the comprehensive plan and are establishing procedures for amending the plan. Many states have laws which require that updating and revision of the comprehensive plan be accomplished according to a fixed timetable. For example, major revisions to the comprehensive plans of both the State University of New York and the City University of New York are required every four years. For those institutions which are not faced with such explicit requirements, a new cycle of comprehensive planning is often initiated when previous versions of the institution's plans are no longer credible to potential benefactors; a fund-raising campaign often provides the impetus for a planning effort.

Comprehensive planning activities characteristically run in five or ten year cycles of intensity. At these intervals, an institution experiences peak activity related to the planning of programs and facilities—but these peaks are a normal consequence of the nature of the planning cycle and should be treated as such. Such peaks should not be considered a signal for undertaking a crash program. Planning must be recognized as a cyclical process in which broad plans are established, are implemented in discrete pieces (with variation from the broad plan being common), and are replaced by a new comprehensive plan, generated in order to reflect both new projections of the future and the realities of the past which have led away from the paths originally charted. The planner must recognize the cyclical pattern of these procedures and schedule the planning activities accordingly.

While the planning process is cyclical and is characterized by periods of peak intensity, the various elements of a comprehensive plan must be geared toward particular planning targets, either specific future years or specified future stages of institutional development (e.g., enrollment levels). Although comprehensive plans focus on a particular target year, certain aspects of the planning process require consideration of different time perspectives. For example, land acquisition planning requires a much larger time horizon than other elements of the planning process.

Theoretically, the process of comprehensive planning should have academic program planning as its primary concern; the facilities planning element logically represents the last of a long series of interconnected steps. A brief description of each of these steps follows:

1. **Goals and Objectives**

   The published material on the subject of planning for any type of organization invariably recommends the setting of goals and objectives as the first step in the process. The recommendation for institutions of higher education is no different.

The very first step in the comprehensive planning process is the development of a statement of the institution's goals. For purposes of this discussion, **GOALS** are defined as highly desirable conditions sought. They are stated in broad qualitative terms and identify specific functional areas of interest. The statement of goals represents the conceptual structure of future institutional development.

Typically, a statement of goals deals with, but is not restricted to, such matters as:

- ►subject-matter areas which are considered within the realm of the institution's interest and capability
- ►place of sponsored research at the institution
- ►posture of the institution with regard to extending special services to individuals or groups outside the institution within the institution's community
- ►subpopulations from which the student body will be drawn
- ►quality of the cultural and physical environment

In the absence of a carefully developed statement of goals and objectives and a conscientious, periodic review of the various elements, planning is likely to become nothing more than an insensitive projection of the past into the future, without direction and without recognition of changing conditions.

Before a statement of goals has particular application to the comprehensive planning process the goals must be expressed more concretely—objectives must be established. For purposes of this discussion, **OBJECTIVES** are defined as specific ends to be achieved in the functional area of the goal which each objective is designed to support. They are stated in quantitative terms which make them useful as guides for the allocation of resources for the achievement of the specific ends. For example, objectives may be concerned with such things as:

- ►desired enrollment at the graduate and undergraduate levels
- ►desired levels of research activity relative to other programs and activities
- ►number of individuals to be served in specific public service programs
- ►number of "disadvantaged" students to be recruited by the institution

2. Program Definition

After the institution's goals have been given quantitative expression (i.e., after objectives have been established), the next step is the development of a proposed set of courses of action by which the desired ends can be achieved (i.e., a comprehensive set of planning assumptions). At almost every step of the planning process it is necessary to make some kind of assumption regarding a particular aspect of the institution's projected future operations. One of the basic assumptions is that which deals with the projected size and composition of the student body. Others deal with such things as instructional staffing policies, staffing patterns for non-academic employees, class-size distributions, research funding, and teaching methods. In the aggregate, this body of assumptions amounts to a proposed course of action.

Internal review procedures make it advisable that these assumptions be collected in a single document rather than scattered throughout the documentation of the planning process. In addition, since planning is an iterative process in which varying sets of assumptions are developed, results are determined, and differences are investigated, the coherent collection of the assumptions for each of the planning cycles is necessary for the comparison of results.

The quantitative expression of institutional goals and the subsequent development of the body of assumptions required to support the planning process should be recognized as the two most important elements of the academic planning process.

3. Program Planning

Having established the institution's goals and objectives and proposed a course of action, the next step is to derive those data which are necessary to the estimation of the amount of resources required to implement the course of action. The basic data include such things as instructional loads on each of the academic departments, number of staff of each type required to carry out the institution's programs, and the distribution of classroom and class laboratory section sizes. In sum, the set of planning assumptions must be applied in order to calculate those factors which can be converted into terms of resource requirements. This process has been designated the process of program planning. Section 2. of Manual Six describes those program planning procedures which are used to develop the data basic to facilities planning.

After the conceptual structure has been developed (after goals and objectives are stated) and after the program planning process has been carried through to completion, the information necessary to facilities planning is available. Until these processes have been completed, there is insufficient data available for effective facilities planning.

4. Facilities Planning

Facilities planning is the process by which the amount of one set of resources (the facilities) required by an institution's programs is estimated. In this respect financial and facilities planning are similar, overlapping processes. Just as one of the objectives of financial planning is to predict the level of operating funds required to support projected levels of activity, one of the objectives of facilities planning is to predict amounts of physical (capital) resources that will be required within a particular time period. This similarity reinforces the point that facilities planning should be viewed as an integral part of the comprehensive planning process rather than as an independent set of procedures.

In general, the outputs of the facilities planning procedures which are required for development of the comprehensive plan are the projected amounts of each type of space required by each department or organizational unit within the institution. There is no need at this rather gross level of planning to deal with such things as the number of Stations in each classroom. An estimate of the total required classroom space usually is sufficient for long-range projections. As a general rule, the more distant the projections (e.g., 20 to 40 years for land use and land acquisition planning), the more general the projections can be (e.g., gross square feet and Assignable Square Feet per full-time equivalent student).

The techniques required for developing the facilities data necessary for the comprehensive plan are presented in Manuals Two through Five. In these manuals two sets of procedures, one detailed and one more general, are presented. In most cases, the general methods are appropriate for use when the facilities portion of a comprehensive plan is being developed. A particular benefit of these general methods is their application in the analysis of the long-range implications of alternative courses of action. An essential characteristic of any planning system is the ability to respond quickly to **"what if"** questions and to assess the long-range costs and consequences of changes in programs or institutional goals. In order to contain within manageable limits the volume of data and the number of mathematical operations required for such repetitive analysis, the general planning methods should be used.

As is frequently emphasized in these manuals, however, some of the criteria basic to use of the general methods can be established only after the detailed procedures have been employed at least once. Therefore, institutions initially should invest the time and effort necessary to carry out the detailed procedures. Once these detailed methods have been carried through, it should be possible to develop more general planning factors which are valid for use. Failure to develop these general criteria from detailed methods can result in planning estimates which are seriously erroneous. Once these general criteria have been developed for a particular institution, the detailed procedures need be used only for purposes of updating and revalidating the general criteria every few years.

The dangers of "borrowing" general criteria from other institutions cannot be overstressed.

5. Facilities Development Program

The facilities planning procedures should yield the estimated facilities requirements for each organizational unit within an institution. The next step in the facilities planning process is the preparation of a facilities development program.

The inputs to the facilities development program are the facilities requirements projected on the basis of the procedures presented in these manuals. These projections then must be aggregated into identifiable building units. This process takes different forms at different institutions. At some, it may be deemed desirable to construct facilities to house specific organizational units; at others, buildings containing a single major type of space (e.g., research laboratories) may be constructed. Practices are so variable as to preclude a specific description of a "best way" or a "recommended procedure" for consolidating space projections into buildings. In general, however, the process followed includes these steps:

- ►Project future amounts of each of the different major types of facilities required by each organizational unit.
- ►Compare these projections with the existing inventory of facilities on both a room type and an organizational unit basis. The inventory should be adjusted to reflect the demolition of any existing facilities that are physically obsolete or that are likely to be removed from use for some other reason during the planning period. It should also be adjusted to indicate the addition of space funded or under construction.
- ►Determine the required additional amount of space of each type and for each organizational unit on the basis of this comparison.
- ►Decide which organizational units will move to new facilities in the planning period and which will be assigned to existing facilities using the established policy-making process of the institution.

The process which bridges the gap between the projection of facilities requirements and the delineation of future building projects is a complex process which is beyond the scope of these manuals. In practice, it is unusual to find a situation in which only the **additional** facilities required by a particular organizational unit are included in a new building. More commonly a building is constructed which is designed to meet the total facilities requirements of one or more organizational units for a specific number of years (i.e., the building includes an allowance for projected, additional facilities requirements as well as replacements for existing facilities). This practice starts a long and involved chain of facilities reassignments on the campus in which some departments move into a new facility, and other departments move or expand into space vacated by the departments occupying new buildings.

The decision as to which organizational units are assigned space in new buildings and which units must be content to have their facilities requirements met through expansion into additional space in older facilities is based on a host of complex, interacting institutional considerations.

Among the considerations which enter into the decision-making process are the preferred objectives of the institution's administration and faculty, the nature and convertibility of the institution's existing facilities, and the availability of land on which to construct buildings in certain sectors of the campus. To illustrate the latter point, physical relationships between facilities may make it more appropriate to build a new law building and convert the existing, centrally located law building for use by departments of arts and letters than to expand the existing law building. Such a decision could reflect a situation in which the law school could be satisfactorily located in a remote part of the campus, whereas the faculty of arts and letters should be centrally located.

In addition, internal "political" considerations are very significant in such decisions. Department chairmen or deans who develop greater influence may be more likely to get the new facilities. Similarly, the availability of funds for certain purposes plays a significant role in the determination of how the additional facilities are to be provided. The federal government's emphasis on science facilities in the 1960s heavily influenced (as it intended) the determination of building priorities on many campuses.

An exhaustive treatment of all the considerations which enter into such decisions is beyond the scope of these manuals. Nor is it possible in these manuals to provide a description of how the various considerations are interrelated; weighed, one against the other; and applied in making the final decision. Decisions such as these reinforce the contention that institutional administration is still very much an art as well as a science. Suffice it to say that ultimately these decisions must indeed be made and that they can be made only at the institutional level. The methods described in these manuals are designed to aid the complex institutional decision-making processes with quantitative analysis and projection of facilities requirements in relation to institutional program plans.

At the completion of this complex process, the projected facilities requirements of an institution will have been conceptualized in terms of specific future buildings. In addition, the occupants of these future buildings, as well as the occupants of space to be vacated by those moving into the new facilities, will have been identified.

6. Site Planning

In simple terms, site planning is the process by which the map of the campus is revised to indicate the disappearance of any buildings scheduled for demolition and the appearance of the projected new buildings, other physical facilities, and landscaping.

For site planning, the projected Assignable Square Feet of facilities must be converted to gross square feet of building area, an initial configuration of the buildings must be proposed (e.g., low-rise versus high-rise), and a general location for the new facilities must be specified.

Development of a site plan normally includes consideration of the following:

- Evaluation of land requirements

  How well can the existing land holdings (or a proposed campus site) accommodate the projected buildings? Ground coverage and building densities, walking distances, parking requirements, circulation needs, and many other factors must be studied and evaluated to determine long-range land acquisition policies.

- Land-use planning

  Building locations by functional groupings and other land uses (parking, playfields, circulation, open space) are evaluated in terms of efficient land use, design character, environmental qualities, and effective circulation and communications.

- Special studies typically are made of utilities requirements and locations; traffic, parking, service, and pedestrian circulation; articulation of the campus with the surrounding community; landscaping development; and the economics of land acquisition.

7. Capital Development Program

The site plan summarizes the changes which are expected to occur in the physical appearance of an institution in the time interval between the present and the target planning year. It does not provide information on the sequence of events within this interval. As a result, it is necessary to establish priorities for facilities projects as well as estimated dates of occupancy. It is also necessary to associate costs with the projects.

This specification of building projects with the priorities and costs associated is frequently referred to as a capital development plan. It may be viewed in either of two ways: as the end of the facilities planning process or as the beginning of the implementation phase. The capital development program summarizes estimated facilities costs resulting from carrying out the proposed programs (courses of action). It also becomes the basis for securing funds required for the needed facilities.

Once a capital development program is promulgated, it becomes a long-term commitment both to internal interests and to external sources of funds (at least, so far as resources will permit). Priorities, however, must be subject to change over a period of time. The availability of funds for one type of building and the unavailability of funds for other types of facilities may compel revision of the priorities. Decisions to develop new programs or drop programs also may alter capital development priorities.

Unanticipated opportunities that are judged to be advantageous and of enduring value to the institution must be acted upon and incorporated into the planning process on a rational basis. The comprehensive plan and the capital development priorities should be continuously reviewed and revised. They should not be so rigidly followed that valuable opportunities are lost. On the other hand, a sound plan and carefully developed capital priorities can provide the basis for evaluating and resisting, if necessary, the pressures for involvement in programs that may have great transient appeal but little lasting substance or value. The central reason for planning is to prevent the dilution of institutional resources and to insure that the central objectives of the institution will be fulfilled.

Since the capital development program is generally the instrument by which resources are solicited, it is at this point that the institution's plans are subjected to review and evaluation by the funding agencies. An approach to systemwide evaluation, consistent with institutional planning methods described in Manuals Two through Five, is presented in Section 5. of Manual Six.

CONCLUSION

Because of the long-range perspective associated with capital investment in land and buildings, the need to make decisions about land acquisition and building location often seems to initiate and dominate the planning process. When this need leads to the initiation of a comprehensive planning process, site planning can provide focus and structure around which in-depth program planning is organized. All too often, however, institutions have produced expensive and elaborate site development plans based on only the most superficial consideration of institutional goals and objectives, program development, and resource requirements. Failure to put facilities and site planning in the proper perspective (in the context of institutional program planning) entails the danger that costly commitments in buildings and land will be made on a wholly inadequate basis. Because of its visible, concrete nature, a site plan which identifies certain facilities with particular academic units or programs takes on the aura of a commitment which is subsequently difficult to alter. Unless the commitments implied in a site plan are based on careful specification of institutional goals and priorities, the ability to adapt the plan over time to changing goals, priorities, and realities is severely restricted.

At the completion of the chain of procedures which constitute the total process of facilities master planning, the institutional planner has available that information which tells him the nature and extent of the facilities requirements of each of the institution's organizational units, the proposed assignments of these organizational units to specific buildings (either existing or to be constructed), a site plan or map which indicates the general (if not specific) locations of these buildings, and a capital development plan indicating costs and an estimated time schedule for the implementation of the facilities plan.

As a final comment it should be stated that it is **particularly** important that comprehensive planning documents be published. The principal users of such documents are individuals such as students, faculty, staff, board members and administrative officers who are mobile and may have a relatively short association with an institution. A periodic, consolidated, comprehensive report describing both verbally and graphically (1) where an institution has been in the past, (2) where it is now, and (3) its academic, facilities, and financial plans for the future is of utmost importance if severe disruptions are to be avoided when knowledgeable individuals leave the institution.

The completion of a master-planning document is only the beginning, not an end unto itself. In fact, the real work doesn't start until the implementation phase is reached. It is one thing to dream, guess, and estimate; it is a far different thing to transform these dreams, guesses, and estimates into reality. Some of the elements of implementing a comprehensive plan are discussed in the following section.

Section 4.2.

The Facilities Planning Cycle

IMPLEMENTATION AND MANAGEMENT PROCESSES

Long-range facilities planning processes require the use of relatively general data and procedures. Not only can much long-range planning be accomplished without resorting to very detailed methods, but use of excessively detailed procedures can actually hinder the planning processes. A central element in planning is the investigation of alternatives, so it is critical that controlling variables and relationships be isolated and that they not be masked by an overabundance of detailed data.

On the other hand, the activities necessary to the implementation of the plans are dependent on the outcomes of much more detailed procedures. General methods are never adequate when the outputs are to be used as the basis for planning a specific building or for implementating some other decision concerning the use of facilities. A brief description of the implementation activities of building programming, design development, and space management, follows:

1. Building Programming

As a preliminary condition to securing capital resources for new facilities or major renovation of existing facilities, it is usually necessary to develop a detailed program for the building or other facility for which funds are being sought.

A building program should be developed by applying the detailed planning methods outlined in Manuals Two through Five and typically should contain the following information:

- ►Justification of the building on the basis of demonstrable program needs and total projected facilities requirements of the institution
- ►Programs and organizational units to be accommodated in the building
- ►Detailed listing of the amounts of each type of space
- ►Basic design requirements and the functional relationships between the various program components and space units
- ►The site for the building and the basic guidelines for building configuration and relationships to this site
- ►Utility requirements of the various space units
- ►Fixed and moveable equipment requirements (usually detailed at a later stage)
- ►Preliminary cost estimates
- ►A timetable

For purposes of space management it may be useful also to include a proposal on the use of space to be vacated by those organizational units which will occupy the new space. Development of the necessary information for building programming requires a degree of understanding that can be acquired only through the application of the detailed planning methods. Once the occupants of the building have been specified, the required amounts of each type of space should be determined on the basis of detailed projections of program development and levels of activity associated with the organizational units to be housed. The amount of effort required for application of the detailed methods is minimized by the fact that these methods need to be applied only to those departments selected as occupants for the new building. While there is a strong temptation to allow the intended occupants to design the building, rigorous program planning and facilities specification is increasingly required for justification to the funding agencies. The result has been a transfer of the emphasis from facilities planning to program planning. This in no way decreases the need for user participation in the planning process. The intense involvement of the intended users of the facility is essential to the acquisition of the inputs to the detailed planning procedures. Building programs should, therefore, be developed by a committee which includes representatives of the proposed users (faculty, staff, and students) as well as individuals who hold administrative positions within the institution.

2. Design Development

Design development is the process by which the general requirements of a building, as expressed in the building program, are translated into a detailed set of plans. This process requires that the building committee, the administrative staff members responsible for facilities construction projects, and the architect who is designing the building work together to accomplish the following:

- Specify the type and size of each of the individual rooms to be included in the building
- Specify the location of each of these rooms in relation to all other rooms to be included (i.e., establish a preliminary set of floor plans for the building)
- Specify the utility service requirements for each of the rooms
- Determine furniture and equipment requirements and, in the case of fixed equipment, specify its location within each room
- Designate construction materials for use throughout the building
- Develop the aesthetic and environmental character of the facility
- Develop increasingly more detailed cost estimates for the building

Since the situation seldom arises in which the building as first designed is within the initial budget, this process is usually repeated. The pressures are normally intense in both directions: those pressing for reduction in scope of the facility to bring it within the budget, and those pressing to increase the budget to allow construction of the most desirable building possible. The result is usually a compromise. Some space is cut out, substitutions of materials are made, some furniture and equipment is eliminated, or major changes are made in the design of the building. On the other hand, additional sources of funds are normally sought when necessary to allow inclusion of elements deemed absolutely essential.

In summary, design development requires a great deal of negotiation between the future occupants and users of the space and those responsible for obtaining and managing the resources necessary for its construction. The fact that changes in the preliminary plans must be expected is further argument for use of a building committee which includes representatives from the group that will ultimately occupy the space. The adjustments in the initial design phases cannot be accomplished without the aid of the members of such a committee. When reductions are required, it is the user who must establish his priorities and identify those pieces which can be eliminated with the least effect on the specific programs.

The final result of this process is a detailed set of working drawings and specifications for construction of the building.

3. Space Management

The completion of a new building typically sets off a chain reaction of relocations and reallocations of space on the campus. The occupants of the new building usually are vacating space that will be assigned to other organizational units after necessary remodeling. In turn, the space vacated by these people may be reassigned to still other departments.

This is the kind of circumstance that brings into play the skills of space management. The planning and programming of the use of vacated space should parallel the planning and design of the new facility. Those responsible for planning the reallocation of space must apply the detailed planning and space-programming methods to all the organizational units or programs that potentially will be affected by the changes in space assignment. Decisions on which units will be reassigned to what facilities and which available resources may be allocated to remodeling and renovation require a considerable amount of trial and error, negotiation, and compromise (particularly in the absence of a well-developed comprehensive plan).

New space is constructed in a configuration which is, at least initially, relatively well matched to the requirements of the new occupants. However, the configuration of space in existing facilities is to a large extent fixed, unless extensive remodeling is done. Since funds for remodeling are often difficult to obtain, attempts are usually made to fit new occupants into older facilities with the least possible change.

Given the constantly changing facilities requirements of the different organizational units within an institution, the scene is set for the very difficult task of managing the institution's facilities resources in an optimal manner. At almost all institutions an administrator responsible for space allocation is faced with a steady stream of requests for more space or for different types of space for the various departments on campus. In the face of these requirements (or demands) the individual or group charged with making decisions regarding space assignments must be provided with the information necessary for making such decisions, as well as full administrative support for carrying out the decisions.

The comprehensive plan greatly aids in making decisions at this level in two ways. First, the capacities of existing facilities can be determined through use of the detailed facilities planning processes. The validity of a department's request for additional space can be evaluated on the basis of these calculations. Such information indicates the relative requirements of the various requesting departments and provides a basis for establishing priorities.

In addition to contributing to the establishment of priorities relating to space management problems, the comprehensive plan also helps in making decisions about the solutions to these problems. The space management problems should be approached from the viewpoint that, insofar as possible, the solutions to current problems will result in movement toward the objectives outlined in the comprehensive plan. For example, if the English department currently is located in Building A and has reached the point where additional space is required, and if the comprehensive plan indicates that the ultimate goal is for this department to be located in Building B, then expansion space for the department should first be sought in Building B. Although it may well be impossible to move toward a given objective without many detours and intermediate steps, the initial attempt at solving the problem should take the form of movement in the directions established in the comprehensive plan.

Just as the realities of the situation can result in revisions in the construction program of an institution, so can the realities of a situation result in changes in the comprehensive plan in areas which affect daily space management problems. Because of the timing of other factors, situations may arise which make concurrence with the comprehensive plan impossible. For example, a department may grow larger than originally projected, thus generating space needs which exceed the amount of space allotted in the comprehensive plan. When such situations arise, there is no choice but to deviate from and, subsequently, to revise the comprehensive plan in accordance with emerging realities.

As funds for new construction have become increasingly limited and as institutions have become larger and more complex, the space management process has become increasingly important. More intensive review of space needs and more careful space budgeting are essential. In many institutions the justification of space needs has become part of the operating budget request procedure.

The space management problem is compounded by the tendency for departments to be highly possessive of the buildings they occupy, especially if the faculty members feel they were instrumental in securing funds for "their" facility. Even if there is an excess of space not immediately required by the primary occupants, there is strong resistance to permitting other organizational units to use the space, even on a temporary basis.

Some institutions have had to proclaim formally that all buildings are institution-wide resources, subject to allocation in the same manner as general operating funds. This requires a formally established procedure for evaluating space requirements and justifying space needs. Increasingly, institutions are including space allocation data and projected requirements as part of the annual operating budget procedures in the context of program budgeting procedures. The space management process then becomes a means of updating the comprehensive plan, since short-run management decisions are tested against long-range goals and objectives on a continuous basis.

The primary contribution of these manuals to the solution of space management problems is the provision of procedures for evaluating capacities of existing facilities in the context of projected future requirements.

SUMMARY

The general planning methods are those which are most useful at the comprehensive planning level. Great amounts of detail are not only unnecessary but may, in fact, hinder the process. Conversely, at the implementation stage, use of the detailed methods is almost mandatory. In programming new buildings and reassigning existing space it is necessary to know all those things which the detailed planning methods (but not the general methods) can provide—such things as Station Count distributions of required classrooms, numbers and types of staff requiring office space, and so forth.

Because the detailed planning methods are used primarily in conjunction with the implementation activities, there is only a limited number of situations in which these methods must be employed across the board. Instead, they are used selectively to determine requirements either for one or two types of space or for a limited number of organizational units. An institution which is starting from the beginning and is constructing a completely new campus to house a new student body must use the detailed procedures for all types of space and for all organizational units. Once the detailed methods have been applied, more general indices can be developed for the institution and can be updated from time to time by the application of detailed procedures on a selective basis.

Implicit in the previous discussion is the notion that it is through the everyday efforts to implement the comprehensive plan that it becomes a living document. Through continued use, the problem areas and variations will be found and, one by one, revised and corrected. While the need remains to review thoroughly the comprehensive plan every five or ten years and to take a hard look at its basic tenets, the daily use and revision of the plan will keep it sufficiently accurate to be a useful tool and to avoid the need to start from the beginning each time a new planning cycle is initiated. Deviations from the original plan must be expected—to have none would mean that the developers were blessed either with unlikely perfect foresight or with extreme amounts of stubbornness which prevented deviation even in the most justifiable situations. The presence of these deviations should serve as a device to prompt review, not as an excuse for invalidating the entire document. The causes for variation should be sought and adjustments made where necessary. If decisions must be made which cause deviations from the plan, so be it. It will still have served its purpose by forcing a thorough review of the implications prior to final action. More fundamentally, it provides a mechanism and a structure by which these implications **can** be investigated.

Section 4.3.

The Facilities Planning Cycle

AREA OF CONCERN OF THE MANUALS

The various steps of the facilities planning and implementation processes were discussed in the previous section. Each of these steps is critical to the effective planning and management of an institution's facilities resources. In order to develop a reference source which treats the topic of facilities planning and management in its entirety, it would be necessary to treat each of the various steps in depth. This is not practical because the outcomes of several of these steps are dependent solely on institutional practice and policy. In addition, for many of the steps, there are no particular procedures which can be generalized and made applicable to a variety of institutions. An example is the step by which the projected space needs are converted to identifiable building units (i.e., creating a facilities development program).

These manuals are concerned only with those steps of the planning and management processes which are procedurally much the same from institution to institution. No attempt is made to discuss those elements which are **unique to each institution.** As a result the primary areas of concern are:

1. Program planning procedures
2. Evaluation of the capacities of existing facilities
3. Projection of future needs for facilities

Procedures for evaluating existing capacities and projecting future needs for the various types of facilities are described in Manuals Two through Five. Program planning procedures are described in Manual Six.

Section 5.

New Dimensions in Space Management

THE IMPACT OF CURRICULUM CHANGES ON FACILITIES*

INTRODUCTION

The formulas and measures employed in modern space management have proven their worth in a variety of ways:

- Assisting officers to learn more about the operation of their institution
- Promoting more rational decisions to be made concerning existing facilities
- Enhancing the effectiveness of planning efforts for future needs
- Interpreting the complex world of academic facilities to state legislatures and other important constituents

Like any powerful instrument, however, the devices of space management are capable of being employed indiscriminately to the detriment of the institution. Perhaps most importantly, the user of modern space management techniques must always bear in mind that the changing nature of the academic enterprise demands that the formulas and measures need constant reexamination. At best, they are an accurate reflection of academic purposes and economic realities; at their worst, they are rigid exercises in irrelevant measurement. The modern manager should insure in three important ways that his techniques are in good working order:

- He should periodically analyze the substance of his academic and extracurricular programs. He may well discover that important shifts in faculty or administrative policy have placed new demands on the physical space of the institution.
- He should modify his measures and formulas to make certain that they are in accord with changes that may have occurred in institutional programs.
- He should regularly determine whether his measures and formulas are, in fact, giving him the data they are designed to yield.

An illustration of the changing nature of institutional space (and of the need for modifications of managerial techniques) can be found at Colorado College in Colorado Springs, a private liberal arts institution with a faculty of 125 and a student body of 1,650. On September 1, 1970, Colorado College adopted a new comprehensive plan that substantially changed the space requirements of the institution and the philosophy of space use. Essentially, the new plan involved an almost complete revision of the concepts of a course, a classroom, a contact hour, a unit of credit, scheduling procedures, and definitions of academic and nonacademic space. Although Colorado College did not employ highly sophisticated techniques of space management to begin with, nevertheless, it has had to alter virtually all of its conventional approaches in order to convert to the new plan. To the extent that the college employed rationalized measures and formulas, they, too, have been subject to drastic revision.

THE COLORADO COLLEGE PLAN

When Colorado College began a systematic review of its program in 1968, the institution followed an academic schedule very typical of American higher education. For a faculty of 125, 40 to 50 classrooms were routinely used for courses with relatively low rates of utilization and no heavy pressure or competition for space. Residential and other auxiliary spaces were organized in the conventional manner. In short, the traditional operation of Colorado College was amenable to most of the measures in these manuals.

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*This section was written by Dr. Glenn Brooks, Professor of Political Science and Faculty Assistant to the President, and Mr. Malcolm Ware, Administrative Assistant to the Dean, Colorado College, Colorado Springs, Colorado.

As Colorado College students, faculty, and administrators probed more deeply into their programs, however, they arrived at some conclusions that had far-reaching implications. They decided that the standard, multiple course system was not as productive for students or faculty as it should be. Everyone felt overly fragmented in his academic efforts; the worthy objectives of liberal education were too often subordinated to immediate, conflicting demands. Courses had to fit the semester format with little room for expansion or contraction. Normal complications of multi-course scheduling restricted the daily routine of students and professors.

Colorado College, as a result of this introspection, decided on a new course plan which abandoned many established assumptions. In place of the regular multi-course system, a plan was adopted under which students would normally take only one or two courses at a time, and faculty members by teaching only one or two courses would match the efforts of students. Courses vary in length from three and one-half weeks to ten and one-half weeks. They also vary in format: some are full-time courses for the student and his professor; others are "half courses" which a student takes two at a time. To make the system even more complex, courses of varying length and format run simultaneously throughout the year. The reason for the complex modular schedule is that departments had different needs for their course sequences.

Once the college had abandoned the multiple course system entirely, it was also able to disregard daily class schedules. Since there are no conflicting courses for the student or the professor, they are free to establish their own timetables for the entire period of a course.

The change in course formats and schedules entailed a fundamental change in the concept of a classroom. Each course was guaranteed a space that it could use exclusively for the entire period of the course and which, within the limits of security and finances, could be set up by the professor and students in the manner they judged most desirable for their purposes. Many members of the faculty had concluded that ordinary classrooms were among the least desirable places for learning on their campus. By giving a professor and his students extensive control over their rooms, which is referred to as the courseroom rather than classroom, the designers of the plan hoped to foster the creation of more responsive environments for learning.

The concern of the college for improving the general quality of their physical campus environment also led to substantial alterations in the extracurricular program of the college. They designed an integrated "leisure program" to provide a contrast and a balance to the relatively intensive courses. Within this program were included many of the ordinary activities and events of the undergraduate campus: athletics, clubs, lectures, performances, and symposiums. But the plan also assumed that students would need additional outlets for their creative energies. Accordingly, the leisure program includes new means of support for experimental student projects such as filmmaking and music for student-initiated seminars and noncredit courses and for a widespread program of college-supported, noncredit arts and crafts.

The new plan also involved changes in the role and use of residence halls. Viewing the housing of the student as a central element in his education, the plan encouraged new styles of residential living with greater emphasis on student self-government, experimental coed housing, and more academic activities in residence halls. For example, a number of the new courserooms are located in small residence hall lounges, not only because the additional courseroom space was needed, but also because the plan called for a better combination of academic and residential affairs. Dormitory lounge areas also may be used for arts and crafts activities. In effect, the idea of a lounge as a large room with sofas may undergo a substantial transformation under the new program. Still another change in the concept of physical space has been occasioned by the added mobility encouraged by the Colorado College Plan. Since students and faculty have virtually complete control over their timetables, they are also in a position to control their movements on and off campus. Many courserooms, therefore, have become little more than bases of operations, because much time is spent off campus or in other parts of the campus. An archaeology course met in its courseroom for the first week, but spent the next two weeks on a dig in southeastern Colorado. They then returned to their courseroom for laboratory analysis of their findings. Courses in literature, classics, and history frequently have migrated between the courseroom, the professors' homes, and other unlikely meeting places (such as the backroom of a popular local bar). These floating courses quite possibly may become the rule rather than the exception, as students and professors discover fresh ways of exploiting their opportunities for learning. Yet the practice of moving around clearly places new stresses on the traditional notion of classrooms.

Finally, the Colorado College Plan seeks to bring the entire physical environment of the institution into better line with central educational purposes. The courserooms are an obvious area in which significant redesign will occur. But the college has also begun to reexamine its exterior spaces to determine how well they support the academic, leisure, and residential programs of the plan. The conversion to the modular course schedule, for example, produced notable changes in the flow of student traffic across the campus. No longer is there an hourly surge of students moving from one class to another. However, the campus was designed implicitly for the standard pattern of student movement. In the long run, then, the college may modify its campus walkways, lighting, and landscaping to produce an environment more conducive to small group gatherings, with less emphasis on large scale movement from one location to another.

In summary, the Colorado College Plan has produced changes in academic, extracurricular, and residential programs which, in turn, have far-reaching implications for the management of physical space for the entire campus. It involved changes in the length, format, and schedule of courses; changes in the concept of credit, contact hours, and teaching loads; a redesign of conventional classrooms; as well as redefinitions of academic and nonacademic spaces. Freedom of scheduling encouraged many classes to shift from one place to another rather than to stay in a single courseroom. Finally, new concepts of environment design have arisen from the conversion to the plan.

MAJOR PHYSICAL SPACE PROBLEMS

The problems encountered in the transition to the new mode of operation are a commentary on the importance and limitations of modern space management. Conversion to the Colorado College Plan has confronted the administration with three types of space difficulties:

- ►They have had to determine whether sufficient space and furniture could be found to accommodate the increased requirements.
- ►They have had to assess the potential costs of such a conversion.
- ►They have had to deal with some of the delicate political problems that emerge when established campus territories are threatened by change.

On the face of it, there appeared to be insufficient courserooms. Under the old plan, only 40 to 50 courserooms were assigned regularly. The new plan called for as many as 120 courserooms at one time. Yet, like so many institutions of higher education, Colorado College did not have an accurate and thorough inventory of all physical space on its campus, and there was no quick way of knowing whether additional space was available. The Colorado College Planning Office began such a survey in the summer of 1969. At the outset, the surveyors made several crucial assumptions:

- Any enclosed space on the campus, whether in a classroom building or not, was potentially usable for a courseroom. (This included secondary residence hall lounges and even fraternity house lounges.)
- Revenue-producing areas in residence halls would be used only as a last resort.
- Special use areas such as laboratories probably would retain their original use, but additional uses might be assigned to them (e.g., a laboratory might be converted to a combination laboratory-seminar area).

One student assistant undertook the task of walking from room to room in every building on the campus with note cards and tapemeasure. Quickly, he began to discover that a great many rooms in regular classroom buildings were actually idle, even though the registrar's office showed that they were being used by departments. In some instances, a perfectly respectable classroom was being used virtually as a storage area. In other cases scheduled classrooms were not being used by the assigned class. Outside of regular classroom buildings, a similar story unfolded. Cozy secondary lounges, relatively free from residence hall traffic, were scarcely being used during daytime hours. Inviting corners of large lounges also appeared to be possibilities for small course groups. Fraternities expressed an eagerness to bring courses into their houses in order to forge more effective bonds with the rest of the college community. Once the old assumptions were changed—that is, once the formal definition of a classroom was abandoned in favor of a more versatile notion—courseroom space began to materialize in all corners of the campus.

Soon the Planning Office could account for 110 potentially workable spaces. This was still short of the optimum number, but it made the courseroom idea seem feasible to skeptics. Even so, the Planning Office could not give answers to several important questions. First, although the total number of rooms was close to being adequate, there was no ready way to determine whether the distribution of course enrollments would match the distribution of courseroom sizes.

This courseroom problem was allayed slightly by a policy decision made by the faculty: under the new college plan, an upper limit of 25 students was established for all course sections taught by one professor, and a limit of 30 for courses taught by two professors.*

With such a policy, the college was in a position to make educated guesses about the number of rooms that would be overly large, the number that would be suitable only for very small classes, and the number that could accommodate any course within the predicted range of 1 to 25. Here the matching process became more troublesome, for

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*This limitation of normal class size to 25 or less probably sounds like sheer luxury to administrators in large institutions. Yet, Colorado College was able to establish this maximum with a student-faculty ratio that is comparable to most other institutions—about 14 to one. In most colleges, class size is considerably larger than the student-faculty ratio because faculty members teach only two or three courses at once, while students take four to six courses. This expands the actual average class size to a level well above the student-faculty ratio. For example, if a college sets three courses as a standard teaching load, but retains five courses as the established student course load, and if the student faculty ratio is 14 to 1, it means that their *average* class size will approximate 23, not 14. But if the faculty course load remains at three courses and the student course load is dropped to three courses as well, the average class size will drop to 14 without adding a single member to the faculty. This, in essence, is what Colorado College did. They established a one-to-one ratio of student and faculty effort: if a faculty member teaches one full-time course, his students take only that course; if he teaches two half-courses, students will take one-half course from him and one-half course from another professor; and if two professors teach a joint course, they agree to take on a proportionately larger number of students. Thus, average class size dropped from about 23 to 14, and the faculty was able to impose a maximum size of 25 on all but the jointly-taught courses.

it became apparent that many classroom buildings had been planned under the orthodox assumption that class sizes would remain what they had been in the past witl numerous classes of 25 to 50 students and a smaller number of upper division classes of 5 to 20.

At this stage of the analysis, other possibilities came to light. The college could predict that a small number of courses would have only four or five students. These courses, it seemed, could meet in the professor's office rather than in a separate courseroom. Assuming that ten percent of all courses would have these small enrollments, the college immediately added another twelve meeting places to its list of potential courserooms. But such an assumption made still another inroad into the traditional concept of classroom space, and further blurred the kinds of physical space distinctions contained in most space analyses.

The college also realized that some courses would be away from the campus and would not require courserooms. The added mobility of the plan thus tended to ease the space pressures slightly. Moreover, the planners discovered that some professors preferred to share a single space in order to take advantage of certain facilities. Again, this had the effect of creating additional space.

Working through the list of faculty and courses, the college planners finally came to the conclusion that the courseroom idea could be made to work. They never would have reached that stage, however, if they had been confined to their old definitions of classroom space.

Closely related to the courseroom problem was the question of furniture. Would there be enough chairs and desks to accommodate the entire faculty and student body sitting down in their courserooms at one time? Once again, a careful inventory of campus furniture revealed that there were more than enough seats to go around. As in the case of the courseroom survey, there remained the question of whether the conventional types of furniture available—the customary armchair desks being most numerous—would be suitable for the style of the new courserooms.

The alternative to using old furniture would be to purchase very expensive new seminar-type furniture. Two factors ruled out this possibility. First, the college was reluctant to spend scarce funds on items that would duplicate what was already available. Secondly, the college decided that it needed at least two years of experimentation under the new plan before making long-term commitments on remodeling or refurnishing. In the experimental years, they reasoned that they would be in a position to try out a variety of courseroom arrangements that would give needed data on the most effective arrangements and possibly avert costly mistakes arising from premature judgments.

Both on courserooms and furnishings, the decision to carry on with the old facilities generated inventiveness among students, faculty, and administrators. Students, for example, began to question the assumption that ordinary chairs were needed for courserooms. Many of them preferred cushions and a comfortable rug. The faculty somewhat more conservative, still tended to call for chairs and blackboards but, in many cases, began to move away from the idea that a standard classroom would be the best model for their new courseroom. Once again, when the old assumptions were modified, the standard measures of classroom space and furnishings became largely inapplicable.

The planning constraints—no major remodeling or refurnishing—substantially lessened the financial impact of the conversion to the new plan, but cost considerations, nevertheless, played an important role. Before the plan was approved by the faculty, departments were queried about the possible financial implications of a conversion. It became evident that three types of expenditure were potentially involved:

- ►New expenditures that would have been necessary with or without the conversion to a new plan
- ►Expenditures that were desirable but not essential to the conversion
- ►Expenditures that were made necessary by the conversion to the plan

As the provost and his associates analyzed the projections, they reached the conclusion that only some $150,000 was required as an increase under the new plan. Roughly one-fourth of that amount concerned changes in the physical plant; the rest was earmarked mainly for special equipment and staff support. Some of the additional outlay was a once-only expenditure. With the financial picture reasonably well outlined, Colorado College administrators felt that they could handle the conversion.

But physical facilities at Colorado College, like most institutions, are not allocated purely on the basis of technical considerations. Faculty members, directors of residence halls, and students themselves develop strongly proprietary attitudes toward rooms and buildings they have occupied for long periods of time. The most highly rationalized system of space allocation may falter if the feelings of users are not properly taken into consideration. For this reason, space planners at Colorado College engaged in long discussions with the occupants of existing space to work out the details of the shift. For the most part, they found departments skeptical but willing to give up certain spaces, partly because the entire college was involved in the conversion and cooperation was the order of the day. A less comprehensive change might well have been more troublesome, since some departments would have maintained the status quo while others converted to a different style of operation.

One of the most delicate problems in the transition was the manner of assigning courseroom space to departments. The solution of the problem came in two stages. First, the registrar assigned sets of courserooms to each department for a semester with the understanding that the rooms would be assigned to individual professors according to departmentally established criteria. Most departments did, in fact, shift courserooms from block to block according to needs of their courses. One department followed a strict seniority system. The senior professors got their choice and the junior men took the leftovers. Since, for many faculty members, the most desirable rooms were those close to the professor's office in his own building, the younger professors in that department were destined to spend most of their time in residence hall lounges and other courserooms outside the department's building area. In spite of some imbalances resulting from the system of cluster assignments, however, the procedure brought the college through the first difficult semester of operation under the new plan.

Later, when faculty and administration had gained experience, the college moved to a system of central assignment by the registrar in consultation with faculty. An important qualification of the recentralized procedure was that faculty members remain free to trade off courserooms if adjustments seem in order. Under the free trade system, some especially desirable courserooms are getting extra use while others are seldom used; some faculty simply prefer to share a good room rather than to hew strictly to the concept of a courseroom devoted entirely to one course.

In both procedures faculty consultation was considered by administrators to be a key to the success of the transition. The point, for purposes of space management, is that any system of allocation that allows the faculty to share in decisions about the allocation of facilities is likely to be more acceptable to the faculty than one which makes arbitrary assignments, however rationally conceived, from a central administrative office.

CHANGES IN THE PHYSICAL ENVIRONMENT

The analysis of space for the Colorado College Plan answered basic questions about the availability of courserooms and furniture, the financial implications, and the political realities of a conversion. The analysis solved some of the strictly quantitative problems, but the qualitative questions still had to be faced; how could the college adapt its old physical environment to serve the best interests of the new educational process? How could professors and students arrange themselves in the courserooms—or in other areas of the campus—for maximum educational effects? To what extent would the environment of the courseroom actually shape the outcome of the educational activities in the room? Do straight rows of chairs and a lectern in front produce relations between students and professors which are distinct from those in which the furniture is arranged in semicircles or in lounge style?

To get a better idea of the relationship between the courseroom and the learning that occurs within it, the college decided to create six experimentally designed courserooms. According to a Planning Office memorandum:

> The main purpose of the new designs is to provide a series of interesting alternatives to conventional classrooms and seminar rooms at the outset of the new plan. In this way, faculty and students will have the opportunity to experience different and perhaps better arrangements for learning. Otherwise, we could possibly find ourselves saddled with courserooms that are as barren as the classrooms we now have.
>
> The experimental designs may also give us useful ideas about long-range remodeling schemes. It seems inadvisable to attempt major remodeling now; we have neither the money nor the inspiration that we will need.
>
> Finally, the designs will be an exercise in imaginative, low cost arrangements that may avert more costly—and perhaps less useful—remodeling now or later.

With these purposes in mind, Malcolm Ware, a recent graduate of the college, assumed responsibility for the development of the experimental courserooms.

He worked with several assumptions in mind:

- ►Students, faculty, and administration would be consulted actively throughout the experimental construction.
- ►Designs would vary from room to room to achieve maximum experimental effect.
- ►Existing furniture, including conventional armchair desks, would be incorporated into some of the designs to determine whether better uses could be found for present inventories of furniture.
- ►Everything in the experimental rooms would be capable of rearrangement with a minimum of effort.
- ►Costs would be restricted to approximately $300 per room, which meant that used furniture, pirated from unorthodox sources such as auctions, would be used rather than new equipment.
- ►Students and faculty using the rooms would be encouraged to make changes according to their particular needs and would be asked to evaluate their reactions to the experimental rooms.

Although at this writing it would be premature to make any generalizations about the success or failure of the experimental designs, it is apparent that the experimental courserooms have begun to affect the users of the rooms and the users of conventional classrooms as well. Students and faculty in the experimental rooms use them for a variety of purposes: regular classes, small group study, informal meetings, and individual socializing. This multiple use confounds the formal definition of classroom space, and any formulas that might be applied to Colorado College utilization would require modification.

People in the experimental rooms also display an unusually proprietary attitude toward the rooms. When a sofa and chair were stolen from one room early in the course, the students were angered when they learned that "their" furniture was missing. Within one day, the student grapevine located the furniture in an off campus apartment, and the offenders themselves returned the furniture without a word from the administration. Janitors report that the experimental rooms are invariably free of cigarette butts and trash, while conventional rooms continue to be littered. More importantly, students and faculty report that the arrangements have made a fundamental difference in the quality of learning.

The experimental courserooms have also exercised a subtle influence on users of conventional classrooms. A number of students and faculty have decided to decorate and rearrange their rooms at their own expense. Even where there are no decorations, straight rows of chairs are gradually giving way to less formal arrangements as the faculty experiment with new learning modes. This, in turn, poses a novel question for space managers: how far should students and faculty be permitted to go in changing the character of courserooms? Should they, for example, be able to paint a room if they felt it was too institutional in color? In the past, most schools have accepted the belief that the administration had the responsibility for planning, maintaining, and modifying the classrooms. But different educational approaches such as the one at Colorado College may require a revision of some of those established procedures as students and faculty develop more incentive as well as more good reasons to manage their own class facilities. Indeed, the winds of change may reach many quarters of physical space management at most institutions of higher education, and the institutions that fail to anticipate such changes may find themselves in difficulty.

IMPLICATIONS FOR FUTURE FACILITIES MANAGEMENT

Let us assume that a space manager is about to begin an evaluation of existing classroom capacity as outlined in the early chapters of this manual. Properly, he would expect to begin by determining the number of Weekly Room Hours and Weekly Student Hours that can be accommodated in existing classrooms. But if an institution is contemplating significant revisions in its academic program, the evaluator will quickly find himself faced with several perplexing questions. What can be defined as an "existing classroom" if academic planners are eyeing new kinds of spaces in residence halls, fraternity houses, and even faculty offices? After that question is satisfactorily answered, he soon faces others. What constitutes a Room Utilization Rate in each courseroom when the nature of that utilization is no longer confined to short, formally scheduled class periods? Here the space manager might be tempted to conclude the formal meeting is the most important of the various activities, and assign heavier weight to conventional course periods simply because they bear more resemblance to established styles of class activity. Yet, it may well be that other activities (e.g., group study and research) will assume greater value in education, and utilization studies will be required to adjust their measures accordingly. In a similar vein, the concept of a Station or a Weekly Student Hour may be subject to modification as a result of new academic programs. If the courseroom idea were more widely adopted, it might also mean that measures of research, residential, and classroom space would require multiple measurements of the same space—x hours for research, y for residential use, and z for course use.

Under the fire of educational reform, still other time-honored constants of space measurement may no longer be applicable. The Colorado College Plan has eliminated the contact hour as a unit of academic measurement. Similarly, the definition of a teacher's load has had to be converted to the number of blocks taught rather than the number of contact hours per week. Such revisions still permit the use of standardized formulas, but the ingredients of those formulas will have to be changed significantly.

The concept of a course is another commonplace in space management that may be forced to yield to academic change. Greater emphasis on interdisciplinary studies, independent work, nonscheduled courses, varying credit, and elastic time periods may render the measure of "the course" as difficult as many other variables. Even within traditional course programs, the standard indices of the credit hour or the length of the course may reveal very little about the amount of work done by a student or professor or about the amount of learning that goes on. The desire for standardized comparisons, however, tends to perpetrate such devices even though they may have limited merit as measures of educational performance.

Finally, educational reforms may call for a reexamination of the utility of learning facilities on a scale yet unimagined. If, as some have contended, regular classrooms are unhelpful, if not highly aversive to effective learning, the space manager could find that many of his own planning assumptions are no longer accepted by the faculty or students. If such an impasse develops, the academic community will be forced to make difficult and sometimes costly choices. Does the institution bring its physical facilities into accord with educational objectives or will those objectives be accommodated to the realities of the physical environment of the campus? Such a choice is not easy. A simplistic decision to remodel facilities could be taken in a hasty and ill-conceived manner. Fads and fashions are widespread in Academe, and the likelihood that experimental programs will come and go is great. Somehow there must be a steady, responsible feedback between the academician and the space manager in a manner that permits gradual adjustment of space needs to proven reforms in academic affairs. The space planner should also anticipate counterpart changes in nonacademic elements of campus life with their own consequent demands on the facilities of the institution.

In short, the formulas and measures that have evolved from the painstaking efforts of administrators and experts are valuable implements for any institution of higher education. But they could become irrelevant or even counterproductive if they are employed without the most assiduous regard for the movements in higher education which ultimately may require a recasting of the entire philosophy of physical space on the American campus.

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

MANUAL TWO

CLASSROOM AND CLASS LABORATORY FACILITIES

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Section 1.

Introduction

CLASSROOM AND CLASS LABORATORY FACILITIES

Manual Two of the *Higher Education Facilities Planning and Management Manuals* includes evaluation and projection procedures for several types of space which support scheduled instructional activities:

Classroom Facilities
Class Laboratory Facilities
Special Class Laboratory Facilities
Individual Study Laboratory Facilities

During the last 10 to 15 years no other collegiate facilities have been studied more intensively than classrooms and class laboratories. This has been true whether such rooms represent less than 10 percent of the space as they typically do in large universities or 50 percent of the space as they typically do in many community colleges. These studies were given impetus by Russell and Doi's *Manual for Studies of Space Utilization in Colleges and Universities* and by intra- and extrainstitutional pressures to make better use of existing physical resources.

The present state of the art in measuring classroom and class laboratory utilization has been restricted usually to the computation of average levels of utilization. The only recognition of the need for differential criteria has been limited to the average number of Assignable Square Feet required for class laboratory Stations in various academic areas. (Some systems have made further allowances for lower and upper division class laboratories.)

Although average values can be useful in developing quick rule-of-thumb approximations, there is no need to use them in a careful evaluation of the capacity of existing rooms or in a comprehensive projection of required facilities. Indeed there are cogent and compelling reasons why averages should not be used. For example, large lecture rooms may be needed because the instructional techniques require them; further, their use may bring certain economies in operating expenses. Either of these two program considerations may be sufficient to justify a lecture room even though its potential utilization is minimal. In the total evaluation of all resource allocations, enhancing the utilization of such a facility may be of relatively minor importance. Therefore, in the development of evaluation and projection techniques for classrooms and class laboratories, it is proposed that these techniques permit the use of differential utilization criteria. Although the techniques presented here illustrate the use of differential criteria based only on Station Count and Classroom (or Class Laboratory) Types, there are other factors which tend to influence the possible utilization levels. A more extensive discussion of these factors is included in Section 4.

Note: *In addition to the utilization criteria defined below, certain other terminology is used in this manual with a specialized meaning. Although all terms are defined in the Glossary in Manual Seven, it is important to understand the way in which two terms are used in the development of the techniques which follow. First, the word "Section" is used where the word "class" might be more commonly used by some. "Section" is used to designate a group of students assembled for instruction in a regularly scheduled meeting of a course, because the word "class" can have not only that meaning but also* *can designate a group of students whose graduation date is the same. Second, "Station Count" is used as a shorthand designation of the longer term "number of Stations in a room."*

This manual discusses three techniques for the evaluation and projection of facility requirements for classrooms and class laboratories. One is a *detailed method* designed to provide information on a specific room-by-room basis. The other two are general *methods* intended to serve as rough rule-of-thumb estimates of classroom and class laboratory requirements.

Each of these three techniques is discussed under three conditions:

►The evaluation of existing facilities
►The projection of requirements for a new institution
►The projection of requirements for an existing institution

Each of these techniques requires certain utilization assumptions. In addition, the evaluation technique and the projection of requirements for an existing institution require inventory data on existing classroom and class laboratory facilities. Also, the two projective techniques require program data yielding numbers of Weekly Room Hours and Weekly Student Hours; for the detailed method these data must be available by Section Size in the case of classrooms and by Laboratory Type in the case of class laboratories.

More specifically, the detailed projection procedures discussed here assume that student enrollments have been projected for specific courses, that the Section Size limitations of those courses are known, and that the facility implications of the courses (number of hours per week of lecture, recitation, class laboratory, etc.) have been specified.

Note: *It is important for the curricular program data to be developed in a form ultimately useful to the building programming process. Curricular program data categories must be consistent with the facilities categories. For example, in order to determine the facility needs for a given Laboratory Type, the program data (course enrollments, maximum Section Size, and number of class laboratory hours of instruction required per Section) must be available on a department-by-department, course-by-course basis for each laboratory course which will be taught in that Laboratory Type.*

Two utilization assumptions are required in the detailed method and in one of the general methods. These are a Room Utilization Rate and a Station Occupancy Ratio. These two utilization criteria and their relationship to other utilization measures are defined below.

Average Room Utilization Rate (AvRUR) is the average number of hours per week a group of rooms is scheduled.

$$\text{Average Room Utilization Rate} = \frac{\text{(Scheduled Weekly Room Hours)}}{\text{(Number of Rooms)}}$$

$$\text{AvRUR} = \text{Average WRH per Room}$$

Note: *A given Room Utilization Rate may represent the average use of all institutional classrooms (or class laboratories) or a specific value for one classroom or a group of classrooms with the same Station Count. As a matter of convention, this manual will limit the use of the term Room Utilization Rate (RUR) to classrooms (or class laboratories) with the same Station Count and of the same Classroom (or Class Laboratory) Type. However, the term Average Room Utilization Rate (AvRUR) will be used with respect to the total number of classrooms (or class laboratories) in an institution (or for some aggregation of rooms with different Station Counts or of different Types).*

Average Station Occupancy Ratio (AvSOR) is the proportion of Stations scheduled for use when the room is scheduled.

$$\text{Average Station Occupancy Ratio} = \frac{(\text{Scheduled Weekly Student Hours per Station})}{(\text{Scheduled Weekly Room Hours per Room})}$$

$$\text{AvSOR} = \frac{(\text{Scheduled WSH/N})}{(\text{Scheduled WRH/R})}$$

Note: *A given Station Occupancy Ratio may represent the average occupancy of all classroom (or class laboratory) Stations or a specific value for one classroom or a group of classrooms with the same Station Count. As a matter of convention, this manual will limit the use of the term Station Occupancy Ratio (SOR) to Stations in classrooms (or class laboratories) with the same Station Count and of the same Classroom (or Class Laboratory) Type. However, the term Average Station Occupancy Ratio (AvSOR) will be used with respect to the total number of Stations in all of the classrooms (or class laboratories) in an institution (or in an aggregation of rooms with different Station Counts or of different Types).*

Average Station Occupancy Ratio (AvSOR) may also be defined as the ratio of Average Section (class) Size to Average Station Count.

$$\text{Average Station Occupancy Ratio} = \frac{(\text{Average Section Size})}{(\text{Average Station Count})}$$

in which:

$$\text{Average Section Size} = \frac{(\text{Scheduled Weekly Student Hours})}{(\text{Scheduled Weekly Room Hours})}$$

$$\text{AvSS} = \text{Average Students per Room}$$

and:

$$\text{Average Station Count} = \frac{(\text{Number of Stations})}{(\text{Number of Rooms})}$$

$$\text{AvSC} = \text{Average Stations per Room}$$

Average Station Utilization Rate (AvSUR) is the average number of hours per week the total number of Stations in a group of rooms is scheduled.

$$\text{Average Station Utilization Rate} = \frac{(\text{Scheduled Weekly Student Hours})}{(\text{Number of Stations})}$$

$$\text{AvSUR} = \text{Average WSH per Station}$$

Average Station Utilization Rate (AvSUR) may also be expressed as the product of the Average Room Utilization Rate and the Average Station Occupancy Ratio.

$$\text{AvSUR} = (\text{AvRUR}) \times (\text{AvSOR})$$

Note: *A given Station Utilization Rate may represent the average use for all classroom (or class laboratory) Stations or a specific value for one classroom or a group of classrooms with the same Station Count. As a matter of convention, this manual will limit the use of the term Station Utilization Rate (SUR) to Stations in classrooms (or class laboratories) with the same Station Count and of the same Classroom (or Class Laboratory) Type. However, the term Average Station Utilization Rate (AvSUR) will be used with respect to the total number of Stations in all of the classrooms (or class laboratories) in an institution (or in an aggregation of rooms with different Station Counts or of different Types).*

It is important to recognize that only formally scheduled hours of instruction are directly involved in the utilization assumptions required by the procedures discussed in this manual. The numerical values which are assumed for Room Utilization Rates and Station Occupancy Ratios represent only the formally scheduled hours of instruction. In setting these assumed utilization rates, sufficient allowance must be made for the nonscheduled and informal use of classroom and class laboratory facilities.

The exposition which follows is limited to procedures and techniques for the evaluation and projection of classroom and class laboratory requirements. The results of the application of these procedures will be only as good as the validity of the program data, the adequacy of the utilization assumptions, and the reliability of the inventory data.

Section 2.

CLASSROOM

INTRODUCTORY COMMENTS

ROOM TYPES INCLUDED

General purpose classrooms, recitation rooms, lecture rooms, seminar rooms, and related service rooms

DISCUSSION

Because a classroom can be used by more than one department, it is considered to be an institutionwide resource.

Because a classroom can serve more than one group of students, it is usually scheduled on a formal basis.

The conjunction of these two conditions is unique to classrooms. Some facilities, such as library study spaces, serve more than one group of students, but they are not scheduled. Other facilities, such as class laboratories, are scheduled, but they are not an institutionwide resource.

Three methods of evaluating or projecting classroom requirements are discussed and illustrated:

- ►A detailed method is developed by which classroom requirements may be determined on a room-by-room basis.
- ►A general method is described by which classroom requirements may be determined only on an overall basis (total numbers of classrooms, Stations, and Assignable Square Feet).
- ►Another general method is presented by which classroom requirements may be determined only on the basis of total Assignable Square Feet.

Each of these three methods are discussed and illustrated under three conditions:

- ►Evaluation techniques are applied to existing classrooms to assess their capacity to accommodate an instructional program.
- ►Projection techniques are applied to the instructional program of a new institution to determine its classroom requirements.
- ►Projection techniques are applied to the instructional program of an existing institution to determine its additional classroom requirements.

Section 2.1.

Detailed Method

CLASSROOM

INTRODUCTORY COMMENTS

The detailed method described and illustrated in the following pages is a procedure recommended for use when the evaluation and projection of classroom requirements must be determined as specifically as possible.

The procedure assumes the availability of very detailed data. In some instances institutions may need to modify the procedure because data of the required level of detail are not available. The procedure is designed to permit such modifications. However, it must be recognized that the validity of the results may be affected when less specific data are used.

Both the evaluation and the projection of classroom facilities require two utilization assumptions: a Room Utilization Rate and a Station Occupancy Ratio. It is a fundamental thesis of this procedure that utilization criteria specific to each classroom (or at least specific to classrooms having the same Station Count) should be used rather than averages applied to all classrooms. In most institutions there is ample justification for less intensive scheduled use of a large lecture room than of the typical classroom. In general, this is true for both the Room Utilization Rate and the Station Occupancy Ratio. At the other end of the scale institutions may vary considerably: some may expect low Room Utilization Rates in small rooms; others may find the highest rates possible in those rooms. The Station Occupancy Ratio, however, is most likely to reach its maximum value for rooms where the Station Count (the number of Stations in the room) most nearly corresponds to the Average Section Size. In most instances the Station Occupancy Ratio can be expected to decrease as the Station Count becomes relatively larger or smaller than the Average Section Size.

In addition to these utilization assumptions, the evaluation of existing classroom capacity requires a detailed inventory of existing classroom facilities. On the basis of the utilization assumptions and inventory data of existing classroom facilities, the evaluation yields estimates of the number of Weekly Room Hours and Weekly Student Hours which existing classrooms of each Station Count can accommodate. It should be noted that this procedure differs from the typical classroom utilization study.

Typical utilization studies generally have been limited to expression of the average use made of all classrooms (or the Stations in them). For many reasons (discussed in Section 4.) not all classrooms can be used equally effectively. It is therefore appropriate to use different utilization criteria for various classrooms (or classroom groups). Typical utilization studies have also been generally limited to hindsight. It seems more useful to evaluate the capacity of each classroom (or group of classrooms) to support an instructional program than to discover that, on the average, the totality of classrooms did not do the job effectively.

In addition to the utilization assumptions described above, the projection of classroom requirements for a new institution requires detailed distributions of Weekly Room Hours and Weekly Student Hours by Section Size. (The methodology for determining these data is discussed in Manual Six.) From these program data and utilization assumptions it is possible to project the required number of classrooms of each Station

Count. That result, combined with an evaluation of the type of classroom seating and consequent Assignable Square Feet per Station, permits the specific designation of the classroom requirements which result from a proposed academic program.

The projection of classroom requirements for an existing institution is similar to that of a new institution. However, it also requires data concerning existing classroom facilities. The procedure results in the specification of the required number of additional classrooms of each Station Count and the Assignable Square Feet in each.

Section 2.1.1

Detailed Method

EVALUATION OF EXISTING CLASSROOM CAPACITY

DISCUSSION

DATA TO BE DETERMINED

Number of

- ►Weekly Room Hours (WRH)
- ►Weekly Student Hours (WSH)

which existing classrooms (of each Station Count) can accommodate

PROGRAM DATA REQUIRED

None

FACILITIES DATA REQUIRED

- ►Number of existing classrooms (R)
- ►Station Count (SC) in each existing classroom
- ►Assignable Square Feet (ASF) in each existing classroom
- ►Assignable Square Feet (ASF) of existing classroom service facilities

ADDITIONAL FACILITIES DATA

If the evaluation includes an assessment of the capability of existing classrooms to accommodate additional Stations (or the desirability of reducing the Station Count), then these data may be helpful.

- ►Information on type of furniture
- ►Floor plans for each room
- ►Schematic drawings of typical furniture arrangements, either drawn to scale or showing essential dimensions

UTILIZATION ASSUMPTIONS REQUIRED

- ►Room Utilization Rate (RUR)
- ►Station Occupancy Ratio (SOR)

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

    - ►Number of existing classrooms (R)
    - ►Station Count (SC) for each existing classroom
    - ►Assignable Square Feet (ASF) for each existing classroom
    - ►Assignable Square Feet (ASF) for existing classroom service facilities

2. Establish utilization rates (for each Station Count) as a matter of institutional policy.

    As indicated in the Introductory Comments (Section 2.1.), it is recommended that utilization criteria specific to each classroom (or at least to classrooms with the same Station Count) should be used.

3. Determine the number of Weekly Room Hours which can be accommodated in existing classrooms (of each Station Count).

   The Weekly Room Hour capacity (WRH_c) is the product of the number of rooms (R) of each Station Count and the Room Utilization Rate (RUR) for each Station Count:

   $$\text{Weekly Room Hour capacity} = (\text{Number of Rooms}) \times (\text{Room Utilization Rate})$$

   $$WRH_c = (R) \times (RUR)$$

   For example, if it is assumed that each classroom with 55 Stations can be used 30 hours per week (Room Utilization Rate) and if there are three rooms with 55 Stations, then

   $$WRH_c = (3) \times (30)$$
   $$= 90 \text{ Weekly Room Hours}$$

   for the three rooms with a Station Count of 55.

4. Determine the number of Weekly Student Hours which can be accommodated in existing classrooms (of each Station Count).

   This Weekly Student Hour capacity (WSH_c) is the product of the number of Stations (N) and the Station Utilization Rate (SUR) for each Station Count.

   $$\text{Weekly Student Hour capacity} = (\text{Number of Stations}) \times (\text{Station Utilization Rate})$$

   $$WSH_c = (N) \times (SUR)^*$$

   For example, if it is assumed that 3 classrooms, each with 55 Stations, can be scheduled 30 hours per week (Room Utilization Rate) and that 0.60 of the seats in each room will be occupied when the room is scheduled (Station Occupancy Ratio), then

   $$\begin{aligned} WSH_c &= (3 \times 55) \times (30 \times 0.60)^* \\ &= (165) \times (18) \\ &= 2{,}970 \text{ Weekly Student Hours} \end{aligned}$$

   for the three rooms with a Station Count of 55.

COMMENTS ON THE PROCEDURE

The procedure outlined above makes no assumption about the quality of the classroom space. If some existing classroom space is of such poor quality that it will no longer be used, then that adjustment should be reflected in Step 1 of the Procedure; that is, the number of rooms, number of Stations, and the Assignable Square Feet of classroom and classroom service space should be reduced by the corresponding numbers and amounts which will no longer be used. Note that the procedure does allow for the limited use of certain rooms by permitting specific Room and/or Station Utilization Rates to be applied to specific classrooms.

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*SUR = (RUR) × (SOR)

Section 2.1.1

Detailed Method

EVALUATION OF EXISTING CLASSROOM CAPACITY

EXAMPLE

DATA TO BE DETERMINED

Number of

- ►Weekly Room Hours (WRH)
- ►Weekly Student Hours (WSH)

which existing classrooms (of each Station Count) can accommodate

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

- ►Number of existing classrooms (R)
- ►Station Count (SC) for each existing classroom
- ►Assignable Square Feet (ASF) for each existing classroom
- ►Assignable Square Feet (ASF) for existing classroom service facilities

These data are tabulated in Table 1.

TABLE 1

INVENTORY OF EXISTING CLASSROOMS

(1)	(2)	(3)	(4)	(5)	(6)
Classroom Type	Station Count* (SC)	Number of Rooms (R)	Assignable Square Feet each Room (ASF/R)	Total Stations (N)	Total Assignable Square Feet (ASF)
				(5)=(2)x(3)	(6=(3)x(4)
Lecture	200	1	2,000	200	2,000
Lecture	100	1	1,200	100	1,200
General Purpose	75	1	1,050	75	1,050
General Purpose	55	3	770	165	2,310
General Purpose	35	4	560	140	2,240
Seminar	35	6	700	210	4,200
Seminar	20	17	500	340	8,500
Seminar	10	7	250	70	1,750
All Classrooms		40	N/A	1,300	23,250
Projection Room		1	150	N/A	150
Total		N/A	N/A	N/A	23,400

*Number of Stations per room.

2. Establish utilization rates for each Station Count as a matter of institutional policy.

   ►Room Utilization Rates (RUR)
   ►Station Occupancy Ratios (SOR)

   These utilization rates are shown in Table 2.

TABLE 2

ASSUMED CLASSROOM UTILIZATION RATES FOR VARIOUS STATION COUNTS*

(1)	(2)	(3)	(4)
Station Count (SC)	Assumed Room Utilization Rate (RUR)	Assumed Station Occupancy Ratio (SOR)	Assumed Station Utilization Rate (SUR) (4)=(2)x(3)
201 and above	20	0.45	9.0
151 - 200	22	0.50	11.0
101 - 150	22	0.50	11.0
91 - 100	26	0.55	14.3
81 - 90	26	0.55	14.3
76 - 80	26	0.55	14.3
71 - 75	28	0.60	16.8
66 - 70	28	0.60	16.8
61 - 65	28	0.60	16.8
56 - 60	28	0.60	16.8
51 - 55	30	0.60	18.0
46 - 50	30	0.60	18.0
41 - 45	30	0.60	18.0
36 - 40	30	0.60	18.0
31 - 35	30	0.70	21.0
26 - 30	30	0.70	21.0
21 - 25	30	0.75	22.5
16 - 20	30	0.83	25.0
11 - 15	32	0.65	20.8
1 - 10	32	0.60	19.2

*Note that the utilization rates displayed in Table 2 are illustrative only and are not recommended as standards. Note also that different utilization rates might be assumed for individual classrooms, for different Classroom Types, or for any appropriate grouping of classrooms.

3. Determine the number of Weekly Room Hours which can be accommodated in existing classrooms (WRH_c) of each Station Count.

   The Weekly Room Hour capacity of classrooms of each Station Count is shown in Table 3.

TABLE 3

WEEKLY ROOM HOUR CAPACITY OF EXISTING CLASSROOMS FOR EACH STATION COUNT

(1)	(2)	(3)	(4)
Station Count (SC)	Number of Rooms (R)	Room Utilization Rate (RUR)*	Weekly Room Hour Capacity (WRH_c) (4)=(2)x(3)
200	1	22	22
100	1	26	26
75	1	28	28
55	3	30	90
35	10	30	300
20	17	30	510
10	7	32	224
Total	40	N/A	1,200

*Note that the same RUR need not be applied to all rooms of a given Station Count. For example, if two of the rooms of 35 Stations were located in a remote part of the campus and these rooms could be scheduled only 20 hours per week, that condition could be reflected in Table 3 by tabulating those two rooms on a separate line with the appropriate RUR.

4. Determine the number of Weekly Student Hours which can be accommodated in existing classrooms (WSH_c) of each Station Count.

   The Weekly Student Hours capacity of classrooms of each Station Count is indicated in Table 4.

TABLE 4

WEEKLY STUDENT HOUR CAPACITY OF EXISTING CLASSROOMS FOR EACH STATION COUNT

(1)	(2)	(3)	(4)	(5)
Station Count (SC)	Number of Rooms (R)	Total Stations (N)	Assumed Station Utilization Rate (SUR)	Weekly Student Hour Capacity (WSH_c) (5)=(3)x(4)
200	1	200	11.0	2,200
100	1	100	14.3	1,430
75	1	75	16.8	1,260
55	3	165	18.0	2,970
35	10	350	21.0	7,350
20	17	340	25.0	8,500
10	7	70	19.2	1,344
Total	40	1,300	N/A	25,054

COMMENT ON THE PROCEDURE

Note that this example makes no allowance for classroom facilities of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the existing facilities data of Steps 1, 3, and 4.

Section 2.1.2

Detailed Method

PROJECTION OF CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Number of classrooms (R) required
►Station Count (SC) for each classroom
►Assignable Square Feet (ASF) for each classroom
►Assignable Square Feet (ASF) for classroom service facilities

PROGRAM DATA REQUIRED

►Projected classroom Weekly Room Hours (WRH) distributed by Section Size (SS)
►Projected classroom Weekly Student Hours (WSH) distributed by Section Size (SS)

These distributions are derived from projected course enrollments distributed by classroom Section Size and number of classroom hours of instruction required per section.

FACILITIES DATA REQUIRED

None

UTILIZATION ASSUMPTIONS REQUIRED

►Room Utilization Rates (RUR)
►Station Occupancy Ratios (SOR)
►Numbers of Assignable Square Feet per Station (ASF/N)

PROCEDURE

1. Obtain the curricular program data from the program planning procedures (discussed in Manual Six).

   ►Weekly Room Hours (WRH) of classroom instruction by Section Size (SS)
   ►Weekly Student Hours (WSH) of classroom instruction by Section Size (SS)

2. Establish utilization rates (for each Station Count) as a matter of institutional policy.

   ►Room Utilization Rate (RUR)
   ►Station Occupancy Ratio (SOR)

3. Determine the required number of classrooms (R) by application of the Room Utilization Rate (RUR) to the distribution of Weekly Room Hours (WRH) by Section Size (SS).

Inspection of the distribution of projected Weekly Room Hours (WRH) by Section Size (SS) provides the basis for determining a tentative Station Count distribution. For example, the Station Count of the largest room must be at least equal to the largest projected Section Size. It may be assumed that smaller Sections will be scheduled in that room up to the level of its Room Utilization Rate. For academic or other reasons some of the smaller Sections may not be appropriate to the largest room. In this case the Station Count of the next-to-the-largest room may be placed at a higher value than actually is required by the distribution of Weekly Room Hours by Section Size.

Other restrictions may be placed on the distribution of Station Counts, if only for computational convenience. For example, it may be assumed that Station Counts will be in multiples of 10 (or 5 or any set of numbers).

After the distribution of tentative Station Counts is determined, the number of rooms for each tentative Station Count is calculated. This is accomplished by the successive accumulation of Weekly Room Hours up to the level of the Room Utilization Rate set in Step 2 for a room of that Station Count. After that room has been theoretically scheduled to its full utilization rate, another room is assumed. When the accumulation of Weekly Room Hours for that room meets the full utilization rate for that room, another room is assumed to be needed. The process continues until all Weekly Room Hours are theoretically accommodated in rooms appropriate to the Section Size at which the Weekly Room Hours occur. The final result is a distribution of the number of rooms among the various tentatively assumed Station Counts.

4. Calculate the required Station Counts (SC) by adjusting the tentatively assumed Station Counts by application of the assumed Station Utilization Rates (SUR).

The distribution of rooms by Station Count (SC) which resulted from the calculations in Step 3 is based on the assumption that absolute scheduling flexibility is possible. **Because such flexibility is not possible,** it is necessary to adjust the tentatively assumed Station Counts to the assumed Station Utilization Rate (SUR).

The adjustment is accomplished by dividing the number of projected Weekly Student Hours (WSH) at each tentatively assumed Station Count (SC) by the assumed Station Utilization Rate (SUR) for that Station Count. The results of this division give the total number of Stations required for rooms of that tentatively assumed Station Count (SC). The calculated Station Count is the calculated number of Stations divided by the number of rooms (determined in Step 3).

Note: *Calculated Station Counts may be larger, smaller, or the same as the tentatively assumed Station Counts. In making the adjustments in Step 5 below it is particularly important to take note of any calculated Station Counts which are smaller than the tentatively assumed Station Counts. Unless these calculated Station Counts are increased to their originally assumed level, the calculations in Step 3 (determination of the number of rooms) are invalidated.*

5. Assign the final Station Counts (SC) and check the Weekly Student Hour capacity (WSH_c) of the proposed distribution of classrooms.

The calculated Station Counts (SC) in Step 4 are uneven, nonmodular numbers. These are modified generally to create a set of modular numbers appropriate to classroom design considerations.

Because the Station Utilization Rate (SUR) in Step 4 was applied to tentatively assumed Station Counts, it must now be applied to the finally assigned Station Counts. Multiplication of the appropriate Station Utilization Rate by the total number of Stations in all rooms of each Station Count provides the number of Weekly Student Hours all rooms of each Station Count will accommodate. The total WSH should be approximately equal to the total projected WSH, and the subtotals of WSH for rooms of each finally assigned Station Count should be approximately equal to the sum of the WSH for each tentatively assumed Station Count.

Note: *In practice it may be necessary to repeat Steps 3, 4, and 5 one or more times using other tentative Station Counts (and/or utilization criteria) if the assigned Station Counts of Step 5 yield a WSH capacity incompatible with the WSH data established in Step 1.*

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required Assignable Square Feet (ASF).

Decisions must be made concerning which rooms will be lecture rooms, which will be general purpose classrooms, and which will be seminar rooms. For each of these, the type of seating must be considered. All of these determinations help to fix the number of Assignable Square Feet per Station (ASF/N) which must be allowed. Multiplication of that value by the number of Stations provides an estimate of the Assignable Square Feet required for each room. Section 2.4. of this manual lists some unit floor area criteria which vary by Station Count as well as by the type of seating.

Classroom service space, which includes such rooms as projection booths, lecture room preparation, storage areas, and so on, typically is determined by an analysis of the specific needs for such facilities (rather than as a percentage or other numerical function of classroom space).

COMMENTS ON THE PROCEDURE

The Station Count in each classroom is determined by use of the assumed Station Utilization Rate. In determining the Station Utilization Rate for each classroom three objectives must be kept in mind.

- ►Room utilization criteria assume optimum utilization of each room. The largest room, therefore, must accommodate not only the largest Section but sufficient Sections of a smaller size until an acceptable room utilization level is reached. Hence, even though the room may be equal in capacity to the size of the largest Section, the empty seats resulting from smaller Section sizes may reduce substantially the average level of Station occupancy.
- ►Design criteria suggest that classrooms be planned in modular increments. Even though there may be enough Sections to warrant a classroom of 32 Stations, and one of 31 Stations, and one of 30 Stations, and so on by increments of 1 Station down to 25, nothing is gained by actually equipping rooms with precisely those numbers of Stations because, architecturally, only one or two distinct Station Counts are practical for that range of Section Sizes.
- ►Scheduling principles require that some excess seating capacity be available. First, the actual size of a Section cannot be known in advance with absolute certainty even with a pre-registration system. Second, room capacities which too closely approximate projected Section Sizes will result in excessive relocation of Sections after actual Section Sizes are known. Reasonable assurance that the originally scheduled classroom will be the actual "home" for a course permits better planning of time-and-place considerations by both faculty and students.

The number of classrooms required is determined by applying the assumed Room Utilization Rate to Weekly Room Hours distributed by Section Size. It is assumed that one room must be large enough to accommodate the largest Section Size. Within the constraints set by practicality, it is assumed that the largest room also will accommodate the next largest Section, and the next largest, and so on, until the desired level of room utilization is met. Then a second room is assumed to be required to accommodate the largest as yet unaccommodated Section, as well as subsequently smaller Sections, until again the Room Utilization Rate for rooms of that Station Count is met. The process continues until the Weekly Room Hours for all Sections requiring classroom space are accounted for.

In determining the Room Utilization Rate at least three considerations must be kept in mind:

- ►Location considerations require that faculty and students not be scheduled *arbitrarily* to classrooms which are located in remote areas.
- ►Specialized-use considerations require the use of classrooms for purposes other than formal instruction. Examples of such use are for colloquia, noncredit seminars, meetings, study space, and set-up time in lecture-demonstration rooms.
- ►Appropriateness-of-size considerations require that the Station Count in a room not be unreasonably greater than the size of the Section which will be scheduled in that room The instructional climate of a very small Section in a very large room generally is unacceptable. This consideration tends to reduce the level of room utilization for large rooms.

The Assignable Square Feet for each classroom is a design problem primarily based on the furniture and internal circulation space. Fixed theater seating and fixed pedestal-type, armchair desks usually require the least area per Station; table and chair and informal lounge types of seating usually require the most. The amount of circulation area within the room is influenced by the distance between Stations, the amount of space allowed for the instructor, and the architectural design module used. The required amount of classroom space usually is specified as Assignable Square Feet per Station. All of the space in the room, not only the space occupied by the furniture but also the internal circulation space, is included in that figure.

Classroom service space usually is a very small part of the total classroom space. It includes such rooms as projection booths for lecture rooms, preparation rooms associated with lecture-demonstration rooms, and so on. No specific techniques or standards are proposed for projecting the amount of such space. The need for such space generally is recognized in the development of program statements for a particular building.

Section 2.1.2

Detailed Method

PROJECTION OF CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

►Number of classrooms (R) required
►Station Count (SC) for each classroom
►Assignable Square Feet (ASF) for each classroom
►Assignable Square Feet (ASF) for classroom service facilities

PROCEDURE

1. Obtain the curricular program data from the program planning procedures (discussed in Manual Six).

►Weekly Room Hours (WRH) of classroom instruction by Section Size (SS)
►Weekly Student Hours (WSH) of classroom instruction by Section Size (SS)

These data are tabulated in Table 5.

TABLE 5

PROJECTED WEEKLY ROOM HOURS AND WEEKLY STUDENT HOURS IN CLASSROOMS BY SECTION SIZE*

(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
173	3	519	39	4	156	19	68	1,292
135	3	405	38	5	190	18	82	1,476
128	2	256	37	3	111	17	67	1,139
91	4	364	36	8	288	16	51	816
75	6	450	35	8	280	15	41	615
57	5	285	34	8	272	14	28	392
56	5	280	33	7	231	13	31	403
53	10	530	32	18	576	12	33	396
51	2	102	31	24	744	11	36	396
50	3	150	30	37	1,110	10	44	440
49	2	98	29	39	1,131	9	30	270
48	3	144	28	36	1,008	8	30	240
47	4	188	27	34	918	7	32	224
46	4	184	26	53	1,378	6	28	168
45	3	135	25	59	1,475	5	28	140
44	4	176	24	62	1,488	4	23	92
43	3	129	23	67	1,541	3	23	69
42	4	168	22	72	1,584	2	24	48
41	4	164	21	74	1,554	1	22	22
40	3	120	20	84	1,680	Total	1,500	31,200

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*Table 5 exhibits projected Weekly Room Hours and Weekly Student Hours by Section Size in greater detail than may be available in many instances. Nevertheless, whether these data are available for individual Section Sizes, as illustrated, or only by ranges of Section Sizes, the techniques in succeeding steps are essentially the same. Further, it should be recognized that projected data such as these will prove to be only moderately accurate. The adjustment for this variance from these projected values is accomplished procedurally in Steps 4 and 5. In practice it must be understood that each projected Section Size may be expected to deviate from the projected values. For ease of understanding and in order not to complicate subsequent tables and calculations only single values are used in Table 5.

2. Establish utilization rates for each Station Count as a matter of institutional policy.

   ►Room Utilization Rates (RUR)
   ►Station Occupancy Ratios (SOR)

   These utilization rates are shown in Table 6.

Table 6

Assumed Classroom Utilization Rates* for Various Station Counts

(1) Station Count (SC)	(2) Assumed Room Utilization Rate (RUR)	(3) Assumed Station Occupancy Ratio (SOR)	(4) Assumed Station Utilization Rate (SUR) (4)=(2)x(3)
201 and above	20	0.45	9.0
151 - 200	22	0.50	11.0
101 - 150	22	0.50	11.0
91 - 100	26	0.55	14.3
81 - 90	26	0.55	14.3
76 - 80	26	0.55	14.3
71 - 75	28	0.60	16.8
66 - 70	28	0.60	16.8
61 - 65	28	0.60	16.8
56 - 60	28	0.60	16.8
51 - 55	30	0.60	18.0
46 - 50	30	0.60	18.0
41 - 45	30	0.60	18.0
36 - 40	30	0.60	18.0
31 - 35	30	0.70	21.0
26 - 30	30	0.70	21.0
21 - 25	30	0.75	22.5
16 - 20	30	0.83	25.0
11 - 15	32	0.65	20.8
1 - 10	32	0.60	19.2

*The utilization rates displayed in Table 6 are illustrative only and are not recommended as standards.

3. Determine the required number of classrooms (R) by application of the Room Utilization Rate (RUR) to the distribution of Weekly Room Hours (WRH) by Section Size (SS).

Because Room Utilization Rates vary according to the magnitude of the Station Counts, it is necessary to use tentatively assumed Station Counts in determining the required number of classrooms. First, the Station Count for the largest classroom should be determined. Inspection of Table 5 indicates that the largest section is projected to be 173 students. It is important, particularly for small institutions and for new institutions, to carefully consider the Station Count of the largest classroom. In this example, a classroom of 200 Stations was chosen because the college was assured that a sufficiently large assembly facility would be available for meetings of the total student body (thus obviating the need for the largest classroom to serve that purpose) and because the faculty believed a lecture Section larger than 200 was not desirable academically (thus committing themselves to multiple Sections for any lecture course in which the number of enrollments exceeded 200).

The utilization assumptions enumerated in Table 6 indicate that the assumed Room Utilization Rate for a classroom with 200 Stations is 22 hours per week. Thus in Table 7 the first line of data can now be entered. One room (column 1) of 200

Stations (column 2) has been tentatively assumed. Its Room Utilization Rate (from column 2 of Table 6) is set at 22 hours per week (column 3). The largest projected Section Size is 173 (column 4); this value as well as the WRH (column 5) and WSH (column 7) are brought forward from Table 5 (columns 1, 2, and 3, respectively). The WSH in column 7 are not necessary to the determination of the number of rooms, but they are included in Table 7 as a matter of convenience for the calculations in Step 4.

After the first line of Table 7 is completed, the second line of data is entered by bringing forward from Table 5 the next Section Size and its corresponding WRH and WSH. Column 6 of Table 7 now needs to be considered. It is the accumulation of WRH entered in column 5. Thus the six cumulative WRH on line 2 of column 6 represent the three WRH on line 1, column 5, plus the three WRH on line 2, column 5.

Data are brought forward from Table 5 until the cumulative WRH value in column 6 equals the assumed Room Utilization Rate in column 3. Equality indicates that the room has been theoretically scheduled to its optimum rate and a new room is then assumed.

Note that the assumed 22 hour RUR is reached at a Section Size of 57. In fact, the five WRH projected for a Section Size of 57 must be split between the largest room and the next largest room. Thus four WRH (or 228 WSH) are assigned to the largest room to bring the cumulative WRH to 22 and the remaining one WRH is assigned to the next largest room. (The 228 WSH are simply the product of the Section Size of 57 and the four Weekly Room Hours.)

Note: *In practice this split of four WRH in a room of 200 Stations and one WRH in a room of 100 Stations may be impractical because all five WRH may be associated with a single course (or two courses with a 3 and 2 split).*

There now remains 1 WRH and 57 WSH (Section Size of 57 times 1 WRH) to be accommodated in the second largest room. A room of 57 Stations would theoretically satisfy the need. However, as Table 7 indicates, a Station Count of 100 was tentatively assumed.

The academic planners felt that the 200 Station Count room might not be appropriate for Sections as small as 57 and 75 (and perhaps those of 91) which theoretically had been assumed to be scheduled in that room. Furthermore, other institutional requirements (faculty meetings, colloquia, extracurricular programs, etc.) suggested the need for a room with 100 Stations.

In a theoretical sense this decision calls into question the validity of the RUR for the 200 Station Count room being set at 22 hours. However, this kind of preciseness can lead to a never-ending, iterative process from which it is difficult to establish practical solutions. Two factors constitute the primary justification for the procedure illustrated here. First, there will be a considerable amount of variance from projected numbers when they cease to be projections and become the actual Section Sizes, Weekly Room Hours, and Weekly Student Hours. Second, enrollment growth beyond the target year set by the projections must be considered, particularly for rooms with large Station Counts. It is relatively easier to add a classroom of 40 Stations than it is to add 40 Stations to an existing room of 200, 100, or 60 Stations. As indicated above, a third factor, noninstructional use, may also affect the Station Count decision for some of the larger rooms.

As in the case of the 200 Station Count room, the Weekly Room Hours are accumulated (column 6) until they reach the Room Utilization Rate assumed for rooms of 100 Stations which in this example is 26 hours per week (column 3). At this point a third room is assumed with a Station Count of 60. This process is repeated throughout Table 7 until all of the Section Sizes, Weekly Room Hours, and Weekly Student Hours projected in Table 5 have been accounted for.

Table 7 illustrates the process for determining the required number of classrooms using the most detailed procedure possible. The procedure implies that the assumed RUR is the most important criterion; thus for each projected classroom the total number of WRH equals the assumed RUR. In practice, both the level of detail and the rigidity of the RUR assumptions may require modification.

It should also be noted that the only purpose of this analysis is to determine the required *number of rooms*. Thus the apparent assumption that 100 percent Station utilization will occur in certain instances (for example, 1 WRH of 40 students in a room of 40 seats, 33 WRH of 30 students in 2 rooms of 30 seats, etc.) is modified in Steps 4 and 5, where the Station Utilization Rate is used to determine a finally assigned Station Count for the rooms.

The detailed data of Table 7 are summarized in the first three columns of Table 8.

TABLE 7

DETERMINATION OF REQUIRED CLASSROOMS

(1)	(2)	(3)†	(4)‡	(5)‡	(6)	(7)‡
Number of Rooms (R)	Tentatively Assumed Station Count (SC)	Assumed Room Utilization Rate (RUR)	Section Size (SS)	Weekly Room Hours (WRH)	Cumulative Weekly Room Hours (CUM WRH)	Weekly Student Hours (WSH)
1	200	22	173	3	3	519
			135	3	6	405
			128	2	8	256
			91	4	12	364
			75	6	18	450
			57	4*	22	228*
				22		2,222
1	100	26	57	1*	1	57*
			56	5	6	280
			53	10	16	530
			51	2	18	102
			50	3	21	150
			49	2	23	98
			48	3	26	144
				26		1,361
1	60	28	47	4	4	188
			46	4	8	184
			45	3	11	135
			44	4	15	176
			43	3	18	129
			42	4	22	168
			41	4	26	164
			40	2	28	80
				28		1,224

*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

TABLE 7 (continued)

(1)	(2)	(3)†	(4)‡	(5)‡	(6)	(7)‡
Number of Rooms (R)	Tentatively Assumed Station Count (SC)	Assumed Room Utilization Rate (RUR)	Section Size (SS)	Weekly Room Hours (WRH)	Cumulative Weekly Room Hours (CUM WRH)	Weekly Student Hours (WSH)
1	40	30	40	1	1	40
			39	4	5	156
			38	5	10	190
			37	3	13	111
			36	8	21	288
			35	8	29	280
			34	1	30	34
				30		1,099
1	40	30	34	7	7	238
			33	7	14	231
			32	16	30	512
				30		981
1	40	30	32	2	2	64
			31	24	26	744
			30	4	30	120
				30		928
1	30	30	30	30	30	900
1	30	30	30	3	3	90
			29	27	30	783
				30		873
1	30	30	29	12	12	348
			28	18	30	504
				30		852
1	30	30	28	18	18	504
			27	12	30	324
				30		828
1	30	30	27	22	22	594
			26	8	30	208
				30		802
1	30	30	26	30	30	780
1	30	30	26	15	15	390
			25	15	30	375
				30		765
1	30	30	25	30	30	750
1	30	30	25	14	14	350
			24	16	30	384
				30		734
1	30	30	24	30	30	720
1	30	30	24	16	16	384
			23	14	30	322
				30		706
1	30	30	23	30	30	690
1	30	30	23	23	23	529
			22	7	30	154
				30		683

*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

Table 7 (continued)

(1) Number of Rooms (R)	(2) Tentatively Assumed Station Count (SC)	(3)† Assumed Room Utilization Rate (RUR)	(4)‡ Section Size (SS)	(5)‡ Weekly Room Hours (WRH)	(6) Cumulative Weekly Room Hours (CUM WRH)	(7)‡ Weekly Student Hours (WSH)
1	30	30	22	30	30	660
1	30	30	22	30	30	660
1	30	30	22	5	5	110
			21	25	30	525
				30		635
1	30	30	21	30	30	630
1	30	30	21	19	19	399
			20	11	30	220
				30		619
1	20	30	20	30	30	600
1	20	30	20	30	30	600
1	20	30	20	13	13	260
			19	17	30	323
				30		583
1	20	30	19	30	30	570
1	20	30	19	21	21	399
			18	9	30	162
				30		561
1	20	30	18	30	30	540
1	20	30	18	30	30	540
1	20	30	18	13	13	234
			17	17	30	289
				30		523
1	20	30	17	30	30	510
1	20	30	17	20	20	340
			16	10	30	160
				30		500
1	20	30	16	30	30	480
1	20	30	16	11	11	176
			15	19	30	285
				30		461
1	20	30	15	22	22	330
			14	8	30	112
				30		442
1	20	30	14	20	20	280
			13	10	30	130
				30		410
1	20	30	13	21	21	273
			12	9	30	108
				30		381

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*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

TABLE 7 (continued)

(1)	(2)	(3)†	(4)‡	(5)‡	(6)	(7)‡
Number of Rooms (R)	Tentatively Assumed Station Count (SC)	Assumed Room Utilization Rate (RUR)	Section Size (SS)	Weekly Room Hours (WRH)	Cumulative Weekly Room Hours (CUM WRH)	Weekly Student Hours (WSH)
1	20	30	12	24	24	288
			11	6	30	66
				30		354
1	20	30	11	30	30	330
1	10	32	10	32	32	320
1	10	32	10	12	12	120
			9	20	32	180
				32		300
1	10	32	9	10	10	90
			8	22	32	176
				32		266
1	10	32	8	8	8	64
			7	24	32	168
				32		232
1	10	32	7	8	8	56
			6	24	32	144
				32		200
1	10	32	6	4	4	24
			5	28	32	140
				32		164
1	10	32	4	23	23	92
			3	9	32	27
				32		119
1	10	32	3	14	14	42
			2	18	18	36
				32		78
1	10	32	2	6	6	12
			1	22	28	22
				28		34

*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

4. Calculate the required Station Count (SC) by adjusting the tentatively assumed Station Count (SC) by application of the assumed Station Utilization Rate (SUR).

   These calculations are shown in Table 8.

   The first three columns of Table 8 are summarized from Table 7, the fourth column is taken from Table 6. The last two columns are calculated as shown.

TABLE 8

ADJUSTMENT OF TENTATIVELY ASSUMED CLASSROOM STATION COUNTS

(1)	(2)	(3)	(4)	(5)	(6)
Number of Rooms (R)	Tentatively Assumed Station Count (SC)	Weekly Student Hours (WSH)	Station Utilization Rate (SUR)	Number of Stations (N) (5)=(3)÷(4)	Calculated Station Count (SC) (6)=(5)÷(1)
1	200	2,222	11.0	202	202
1	100	1,361	14.3	95	95
1	60	1,224	16.8	73	73
3	40	3,008	18.0	167	56
18	30	13,287	21.0	633	35
17	20*	8,385	25.0	335	19*
9	10	1,713	19.2	89	10
Total 50	N/A	31,200	N/A	1,594	N/A

*Note that the calculated Station Count 19 is smaller than the tentatively assumed Station Count 20. This discrepancy is corrected in the next step by making the finally assigned Station Count 20, thereby obviating the need to make adjustments and reiterate the calculations in Step 3.

5. Assign the final Station Counts (SC) and check the Weekly Student Hour capacity (WSH_c) of the proposed distribution of classrooms.

   The data are presented in Table 9.

   The first column of Table 9 is brought forward from column 1 of Table 8. The second column of Table 9 represents an arbitrary rounding (to modular numbers) of column 6 in Table 8. The third column is the mathematical product of the first two. The fourth column is taken from column 4 of Table 6. The fifth column is the mathematical product of the third and fourth columns ($WSH_c = N \times SUR$). The sixth column is summarized from Table 7 and is identical to the third column of Table 8.

TABLE 9

FINALLY ASSIGNED STATION COUNTS AND WEEKLY STUDENT HOUR CAPACITIES OF CLASSROOMS

(1)	(2)	(3)	(4)	(5)	(6)
				Weekly Student Hour Capacity Based Upon:	
Number of Rooms (R)	Finally Assigned Station Count (SC)	Total Stations (N) (3)=(1)x(2)	Station Utilization Rate (SUR)	Finally Assigned Station Count (WSH_c) (5)=(3)x(4)	Tentatively Assumed Station Count (WSH_c)
1	200	200	11.0	2,200	2,222
1	100	100	14.3	1,430	1,361
1	75	75	16.8	1,260	1,224
3	55	165	18.0	2,970	3,008
18	35	630	21.0	13,230	13,287
17	20	340	25.0	8,500	8,385
9	10	90	19.2	1,728	1,713
Total 50	N/A	1,600	N/A	31,318	31,200

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required Assignable Square Feet (ASF).

   These data are tabulated in Table 10.

TABLE 10

REQUIRED ASSIGNABLE SQUARE FEET IN CLASSROOMS AND CLASSROOM SERVICE

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Classroom Type	Finally Assigned Station Count (SC)	Number of Rooms (R)	Assignable Square Feet per Station* (ASF/N)	Assignable Square Feet per Room (ASF/R)	Total Stations (N)	Total Assignable Square Feet (ASF)
				(5)=(2)x(4)	(6)=(2)x(3)	(7)=(3)x(5)
Lecture	200	1	10	2,000	200	2,000
Lecture	100	1	12	1,200	100	1,200
General Purpose	75	1	14	1,050	75	1,050
General Purpose	55	3	14	770	165	2,310
General Purpose	35	9	16	560	315	5,040
Seminar	35	9	20	700	315	6,300
Seminar	20	17	25	500	340	8,500
Seminar	10	9	25	250	90	2,250
Subtotals	N/A	50	N/A	N/A	1,600	28,650
Projection Room	N/A	1	N/A	N/A	N/A	150
Total	N/A	51	N/A	N/A	1,600	28,800

*The Assignable Square Feet per Station in Table 10 are illustrative only and are not recom mended as standards.

Section 2.1.3

Detailed Method

PROJECTION OF CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Additional number of classrooms (R) required
►Station Count (SC) for each additional classroom
►Assignable Square Feet (ASF) for each additional classroom
►Assignable Square Feet (ASF) for additional classroom service facilities

PROGRAM DATA REQUIRED

►Projected classroom Weekly Room Hours (WRH) distributed by Section Size (SS)
►Projected classroom Weekly Student Hours (WSH) distributed by Section Size (SS)

These distributions are derived from projected course enrollments distributed by classroom Section Size and number of classroom hours of instruction required per Section.

FACILITIES DATA REQUIRED

►Number of existing classrooms (R)
►Station Count (SC) in each existing classroom
►Assignable Square Feet (ASF) in each existing classroom
►Assignable Square Feet (ASF) in existing classroom service facilities

ADDITIONAL FACILITIES DATA

If the evaluation includes an assessment of the capability of existing classrooms to accommodate additional Stations or the desirability of reducing the Station Count (SC), then these data may be helpful.

►Information on type of furniture
►Floor plans for each room and/or
►Schematic drawings of typical furniture arrangements, either drawn to scale or showing essential dimensions

UTILIZATION ASSUMPTIONS REQUIRED

►Room Utilization Rates (RUR)
►Station Occupancy Ratios (SOR)
►Numbers of Assignable Square Feet per Station (ASF/N)

PROCEDURE

1. Obtain the curricular program data from the program planning procedure (discussed in Manual Six).

►Weekly Room Hours (WRH) by Section Size (SS)
►Weekly Student Hours (WSH) by Section Size (SS)

2. Establish utilization rates (for each Station Count) as a matter of institutional policy.

►Room Utilization Rate (RUR)
►Station Occupancy Ratio (SOR)

3. Determine the required number of classrooms (R) by application of the Room Utilization Rate (RUR) to the distribution of Weekly Room Hours (WRH) b Section Size (SS).

   Inspection of the distribution of projected Weekly Room Hours (WRH) by Section Size (SS) provides the basis for determining a tentative Station Count distribution. For example, the Station Count of the largest room must be at least equal to the largest projected Section Size. It may be assumed that smaller Sections will be scheduled in that room up to the level of its Room Utilization Rate. For academic or other reasons, some of the smaller Sections may not be appropriate to the largest room. In this case, the Station Count of the next to the largest room may be placed at a higher value than actually is required by the distribution of Weekly Room Hours by Section Size.

   Other restrictions may be placed on the distribution of Station Counts, if only for computational convenience. For example, it may be assumed that Station Counts will be in multiples of 10 (or 5 or any set of numbers).

   After the distribution of tentative Station Counts is determined, the number of rooms for each tentative Station Count is calculated. This is accomplished by the successive accumulation of Weekly Room Hours up to the level of the Room Utilization Rate in Step 2 for a room of that Station Count. After that room has been theoretically scheduled to its full utilization rate, another room is assumed. When the accumulation of Weekly Room Hours for that room meets the full utilization rate for that room, another room is assumed to be needed. The process continues until all Weekly Room Hours are theoretically accommodated in rooms appropriate to the Section Size at which the Weekly Room Hours occur. The final result is a distribution of the number of rooms among the various tentatively assumed Station Counts.

4. Calculate the required Station Counts (SC) by adjusting the tentatively assume Station Counts by application of the assumed Station Utilization Rates (SUR).

   The distribution of rooms by Station Count (SC) which resulted from the calculations in Step 3 is based on the assumption that absolute scheduling flexibility is possible. **Because such flexibility is not possible,** it is necessary to adjust the tentatively assumed Station Counts to the assumed Station Utilization Rate (SUR).

   The adjustment is accomplished by dividing the number of projected Weekly Student Hours (WSH) at each tentatively assumed Station Count (SC) by the assumed Station Utilization Rate (SUR) for that Station Count. The results of this division give the total number of Stations required for rooms of that tentatively assumed Station Count (SC). The calculated Station Count is the calculated number of Stations divided by the number of rooms (determined in Step 3).

   Note: *Calculated Station Counts may be larger, smaller, or the same as the tentatively assumed Station Counts. In making the adjustments in Step 5 below it is particularly important to take note of any calculated Station Counts which are smaller than the tentatively assumed Station Counts. Unless these calculated Station Counts are increased to their originally assumed level, the calculations in Step 3 (determination of the number of rooms) are invalidated.*

5. Assign the final Station Counts (SC) and check the Weekly Student Hour capacity (WSH_c) of the proposed distribution of classrooms.

   The calculated Station Counts (SC) in Step 4 are uneven, nonmodular numbers. These are modified generally to create a set of modular numbers appropriate to classroom design considerations.

   Because the Station Utilization Rate (SUR) in Step 4 was applied to tentatively assumed Station Counts, it must now be applied to the finally assigned Station Counts. Multiplication of the appropriate Station Utilization Rate by the total number of Stations in all rooms of each Station Count provides the number of Weekly Student Hours all rooms of each Station Count will accommodate. The total WSH should be approximately equal to the total projected WSH, and the subtotals of WSH for rooms of each finally assigned Station Count should be approximately equal to the sum of the WSH for each tentatively assumed Station Count.

   Note: *In practice it may be necessary to repeat Steps 3, 4, and 5 one or more times using other tentative Station Counts (and/or utilization criteria) if the assigned Station Counts of Step 5 yield a WSH capacity incompatible with the WSH data established in Step 1.*

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required Assignable Square Feet (ASF).

   Decisions must be made concerning which rooms will be lecture rooms, which will be general purpose classrooms, and which will be seminar rooms. For each of these, the type of seating must be considered. All of these determinations help to fix the number of Assignable Square Feet per Station (ASF/N) which must be allowed. Multiplication of that value by the number of Stations provides an estimate of Assignable Square Feet required for each room. Section 2.4. of this manual lists some unit floor area criteria which vary by Station Count as well as by the type of seating.

   Classroom service space, which includes such rooms as projection booths, lecture room preparation, storage areas, and so on, typically is determined by an analysis of the specific needs for such facilities (rather than as a percentage or other numerical function of classroom space).

7. Compare the existing and projected numbers of classrooms (R) and Stations (N) to determine the required numbers of additional rooms and Stations.

   In some instances, an "excess" of classrooms of certain Station Counts may exist on the basis of projected data. Two courses of action are possible. One is to continue to use the classrooms at their present Station Count. This lowers the Station Occupancy Ratio below assumed levels. The other is to modify the number of Stations, either by removal of seats or by remodeling the space, so that rooms of the desirable Station Count and Assignable Square Feet are created.

   In practice the resulting distribution of additional classrooms may not constitute a set of rooms which an institution would want an architect to design in a single building. Considerations of this kind involving space management and building programming are important complex problems which are deemed to be beyond the purview of this manual.

8. Determine the additional number of classrooms (R) required, the Station Count (SC) for each room, and the Assignable Square Feet (ASF).

COMMENTS ON THE PROCEDURE

See Comments on the Procedure in the previous discussion of new institutions, Section 2.1.2.

Note also that the procedure outlined above makes no assumption about the quality of the existing classroom facilities. If some of the existing classroom space is of such poor quality that it will be abandoned or converted to other uses between the present time and the point in time to which the projected program data apply, then the "existing" facilities assumed in Step 7 should be adjusted to reflect only the classrooms which will still exist at the time assumed as the target year for the projected program data.

Section 2.1.3

Detailed Method

PROJECTION OF CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

- ►Additional number of classrooms (R) required
- ►Station Count (SC) for each additional classroom
- ►Assignable Square Feet (ASF) for each additional classroom
- ►Assignable Square Feet (ASF) for additional classroom service facilities

PROCEDURE

1. Obtain the curricular program data from the program planning procedure (discussed in Manual Six).

- ►Weekly Room Hours (WRH) by Section Size (SS)
- ►Weekly Student Hours (WSH) by Section Size (SS)

These data are tabulated in Table 11.

TABLE 11

PROJECTED WEEKLY ROOM HOURS AND WEEKLY STUDENT HOURS IN CLASSROOMS BY SECTION SIZE*

(1) Section Size (SS)	(2) Weekly Room Hours (WRH)	(3) Weekly Student Hours (WSH)	(1) Section Size (SS)	(2) Weekly Room Hours (WRH)	(3) Weekly Student Hours (WSH)	(1) Section Size (SS)	(2) Weekly Room Hours (WRH)	(3) Weekly Student Hours (WSH)
173	3	519	39	4	156	19	68	1,292
135	3	405	38	5	190	18	82	1,476
128	2	256	37	3	111	17	67	1,139
91	4	364	36	8	288	16	51	816
75	6	450	35	8	280	15	41	615
57	5	285	34	8	272	14	28	392
56	5	280	33	7	231	13	31	403
53	10	530	32	18	576	12	33	396
51	2	102	31	24	744	11	36	396
50	3	150	30	37	1,110	10	44	440
49	2	98	29	39	1,131	9	30	270
48	3	144	28	36	1,008	8	30	240
47	4	188	27	34	918	7	32	224
46	4	184	26	53	1,378	6	28	168
45	3	135	25	59	1,475	5	28	140
44	4	176	24	62	1,488	4	23	92
43	3	129	23	67	1,541	3	23	69
42	4	168	22	72	1,584	2	24	48
41	4	164	21	74	1,554	1	22	22
40	3	120	20	84	1,680	Total	1,500	31,200

*Table 11 exhibits projected Weekly Room Hours and Weekly Student Hours by Section Size in greater detail than may be available in many instances. Nevertheless, whether these data are available for individual Section Sizes, as illustrated, or only by ranges of Section Sizes, the techniques in succeeding steps are essentially the same. Further, it should be recognized that projected data such as these will prove to be only moderately accurate. The adjustment for this variance from these projected values is accomplished procedurally in Steps 4 and 5. In practice it must be understood that each projected Section Size may be expected to deviate from the projected values. For ease of understanding and in order not to complicate subsequent tables and calculations only single values are used in Table 11.

2. Establish utilization rates for each Station Count as a matter of institutional policy.

   ►Room Utilization Rates (RUR)
   ►Station Occupancy Ratios (SOR)

   These utilization rates are shown in Table 12.

TABLE 12

ASSUMED CLASSROOM UTILIZATION RATES* FOR VARIOUS STATION COUNTS

(1)	(2)	(3)	(4)
Station Count (SC)	Assumed Room Utilization Rate (RUR)	Assumed Station Occupancy Ratio (SOR)	Assumed Station Utilization Rate (SUR) (4)=(2)x(3)
201 and above	20	0.45	9.0
151 - 200	22	0.50	11.0
101 - 150	22	0.50	11.0
91 - 100	26	0.55	14.3
81 - 90	26	0.55	14.3
76 - 80	26	0.55	14.3
71 - 75	28	0.60	16.8
66 - 70	28	0.60	16.8
61 - 65	28	0.60	16.8
56 - 60	28	0.60	16.8
51 - 55	30	0.60	18.0
46 - 50	30	0.60	18.0
41 - 45	30	0.60	18.0
36 - 40	30	0.60	18.0
31 - 35	30	0.70	21.0
26 - 30	30	0.70	21.0
21 - 25	30	0.75	22.5
16 - 20	30	0.83	25.0
11 - 15	32	0.65	20.8
1 - 10	32	0.60	19.2

*The utilization rates displayed in Table 12 are illustrative only and are not recommended as standards.

3. Determine the required number of classrooms (R) by application of the Room Utilization Rate (RUR) to the distribution of Weekly Room Hours (WRH) by Section Size (SS).

   Because Room Utilization Rates vary according to the magnitude of the Station Counts, it is necessary to use tentatively assumed Station Counts in determining the required number of classrooms. First, the Station Count for the largest classroom should be determined. Inspection of Table 11 indicates that the largest Section is projected to be 173 students. It is important, particularly for a small institution, to carefully consider the Station Count of the largest classroom. In this example, a classroom of 200 Stations was chosen because the college had a sufficiently large assembly facility available for meetings of the total student body (thus obviating the need for the largest classroom to serve that purpose) and because the faculty believed a lecture Section larger than 200 was not desirable academically (thus committing themselves to multiple lecture Sections for any lecture course exceeding 200 enrollments).

   The utilization assumptions enumerated in Table 12 indicate that the assumed Room Utilization Rate for a classroom with 200 Stations is 22 hours per week. Thus in Table 13 the first line of data can now be entered. One room (column 1) of 200 Stations (column 2) has been tentatively assumed. Its Room Utilization Rate (from column 2 of Table 12) is set at 22 hours per week (column 3). The largest projected Section Size is 173 (column 4); this value as well as the WRH (column 5) and WSH (column 7) are brought forward from Table 11 (columns 1, 2, and 3, respectively). The WSH in column 7 are not necessary to the determination of the number of rooms, but they are included in Table 13 as a matter of convenience for the calculations in Step 4.

After the first line of Table 13 is completed, the second line of data is entered by bringing forward from Table 11 the next Section Size and its corresponding WRH and WSH. Column 6 of Table 13 now needs to be considered. It is the accumulation of WRH entered in column 5. Thus the six cumulative WRH on line 2 of column 6 represent the three WRH on line 1, column 5, plus the three WRH on line 2, column 5.

Data are brought forward from Table 11 until the cumulative WRH (column 6) equals the assumed Room Utilization Rate in column 3, which indicates that the room has been theoretically scheduled to its optimum rate and a new room is then assumed.

Note that the assumed 22 hour RUR is reached at the Section Size of 57. In fact, the 5 WRH projected for a Section Size of 57 must be split between the largest room and the next largest room. Thus 4 WRH (or 228 WSH) are assigned to the largest room to bring the cumulative WRH to 22 and the remaining 1 WRH is assigned to the next largest room. (The 228 WSH are simply the product of the Section Size of 57 and the 4 Weekly Room Hours.)

Note: *In practice this split of 4 WRH in a room of 200 Stations and 1 WRH in a room of 100 Stations may be impractical because all 5 WRH may be associated with a single course (or two courses with a 3 and 2 split).*

There now remain 1 WRH and 57 WSH (Section Size of 57 times 1 WRH) to be accommodated in the second largest room. A room of 57 Stations would theoretically satisfy the need. However, as Table 13 indicates, a Station Count of 100 was tentatively assumed.

The academic planners felt that the 200 Station Count room might not be appropriate for Sections as small as 57 and 75 (and perhaps those of 91) which theoretically had been assumed to be scheduled in that room. Furthermore, other institutional requirements (faculty meetings, colloquia, extracurricular programs, etc.) suggested the need for a room with 100 Stations.

In a theoretical sense this decision calls into question the validity of the RUR for the 200 Station Count room being set at 22 hours. However, this kind of preciseness can lead to a never-ending iterative process from which it is difficult to establish practical solutions. Two factors constitute the primary justification for the procedure illustrated here. First, there will be a considerable amount of variance from projected numbers when they cease to be projections and become the actual Section Sizes, Weekly Room Hours, and Weekly Student Hours. Second, enrollment growth beyond the target year set by the projections must be considered, particularly for rooms with large Station Counts. It is relatively easier to add a classroom of 40 Stations than it is to add 40 Stations to an existing room of 200, 100, or 60 Stations. As indicated above, a third factor, noninstructional use, may also affect the Station Count decision for some of the larger rooms.

As in the case of the 200 Station Count room, the Weekly Room Hours are accumulated (column 6) until they reach the Room Utilization Rate assumed for rooms of 100 Stations, which in this example is 26 hours per week (column 3).

At this point a third room is assumed with a Station Count of 60. This process is repeated throughout Table 13 until all of the Section Sizes, Weekly Room Hours, and Weekly Student Hours projected in Table 11 have been accounted for.

Table 13 illustrates the process of determining the required number of classrooms using the most detailed procedure possible. The procedure implies that the assumed RUR is the most important criterion; thus for each projected classroom the total number of WRH equals the assumed RUR. In practice, both the level of detail and the rigidity of the RUR assumption may require modification.

It should also be noted that the only purpose of this analysis is to determine the required *number of rooms*. Thus the apparent assumption that 100 percent Station utilization will occur in certain instances (for example, 1 WRH of 40 students in a room of 40 seats, 33 WRH of 30 students in 2 rooms of 30 seats, etc.) is modified in Steps 4 and 5 below, where the Station Utilization Rate is used to determine a finally assigned Station Count for the rooms.

The detailed data of Table 13 are summarized in the first three columns of Table 14.

TABLE 13

DETERMINATION OF REQUIRED CLASSROOMS

(1)	(2)	(3)†	(4)‡	(5)‡	(6)	(7)‡
Number of Rooms (R)	Tentatively Assumed Station Count (SC)	Assumed Room Utilization Rate (RUR)	Section Size (SS)	Weekly Room Hours (WRH)	Cumulative Weekly Room Hours (CUM WRH)	Weekly Student Hours (WSH)
1	200	22	173	3	3	519
			135	3	6	405
			128	2	8	256
			91	4	12	364
			75	6	18	450
			57	4*	22	228*
				22		2,222
1	100	26	57	1*	1	57*
			56	5	6	280
			53	10	16	530
			51	2	18	102
			50	3	21	150
			49	2	23	98
			48	3	26	144
				26		1,361
1	60	28	47	4	4	188
			46	4	8	184
			45	3	11	135
			44	4	15	176
			43	3	18	129
			42	4	22	168
			41	4	26	164
			40	2	28	80
				28		1,224

*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 11, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 13. An explanation of the reason for this is given in Step 3 of the text preceding Table 13.

†Data in this column are from Table 12.

‡Data in these columns are from Table 11.

TABLE 13 (continued)

(1) Number of Rooms (R)	(2) Tentatively Assumed Station Count (SC)	(3)† Assumed Room Utilization Rate (RUR)	(4)‡ Section Size (SS)	(5)‡ Weekly Room Hours (WRH)	(6) Cumulative Weekly Room Hours (CUM WRH)	(7)‡ Weekly Student Hours (WSH)
1	40	30	40	1	1	40
			39	4	5	156
			38	5	10	190
			37	3	13	111
			36	8	21	288
			35	8	29	280
			34	1	30	34
				30		1,099
1	40	30	34	7	7	238
			33	7	14	231
			32	16	30	512
				30		981
1	40	30	32	2	2	64
			31	24	26	744
			30	4	30	120
				30		928
1	30	30	30	30	30	900
1	30	30	30	3	3	90
			29	27	30	783
				30		873
1	30	30	29	12	12	348
			28	18	30	504
				30		852
1	30	30	28	18	18	504
			27	12	30	324
				30		828
1	30	30	27	22	22	594
			26	8	30	208
				30		802
1	30	30	26	30	30	780
1	30	30	26	15	15	390
			25	15	30	375
				30		765
1	30	30	25	30	30	750
1	30	30	25	14	14	350
			24	16	30	384
				30		734
1	30	30	24	30	30	720
1	30	30	24	16	16	384
			23	14	30	322
				30		706
1	30	30	23	30	30	690
1	30	30	23	23	23	529
			22	7	30	154
				30		683

*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

TABLE 13 (continued)

(1) Number of Rooms (R)	(2) Tentatively Assumed Station Count (SC)	(3)† Assumed Room Utilization Rate (RUR)	(4)‡ Section Size (SS)	(5)‡ Weekly Room Hours (WRH)	(6) Cumulative Weekly Room Hours (CUM WRH)	(7)‡ Weekly Student Hours (WSH)
1	30	30	22	30	30	660
1	30	30	22	30	30	660
1	30	30	22	5	5	110
			21	25	30	525
				30		635
1	30	30	21	30	30	630
1	30	30	21	19	19	399
			20	11	30	220
				30		619
1	20	30	20	30	30	600
1	20	30	20	30	30	600
1	20	30	20	13	13	260
			19	17	30	323
				30		583
1	20	30	19	30	30	570
1	20	30	19	21	21	399
			18	9	30	162
				30		561
1	20	30	18	30	30	540
1	20	30	18	30	30	540
1	20	30	18	13	13	234
			17	17	30	289
				30		523
1	20	30	17	30	30	510
1	20	30	17	20	20	340
			16	10	30	160
				30		500
1	20	30	16	30	30	480
1	20	30	16	11	11	176
			15	19	30	285
				30		461
1	20	30	15	22	22	330
			14	8	30	112
				30		442
1	20	30	14	20	20	280
			13	10	30	130
				30		410
1	20	30	13	21	21	273
			12	9	30	108
				30		381

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*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

TABLE 13 (continued)

(1) Number of Rooms (R)	(2) Tentatively Assumed Station Count (SC)	(3)† Assumed Room Utilization Rate (RUR)	(4)‡ Section Size (SS)	(5)‡ Weekly Room Hours (WRH)	(6) Cumulative Weekly Room Hours (CUM WRH)	(7)‡ Weekly Student Hours (WSH)
1	20	30	12	24	24	288
			11	6	30	66
				30		354
1	20	30	11	30	30	330
1	10	32	10	32	32	320
1	10	32	10	12	12	120
			9	20	32	180
				32		300
1	10	32	9	10	10	90
			8	22	32	176
				32		266
1	10	32	8	8	8	64
			7	24	32	168
				32		232
1	10	32	7	8	8	56
			6	24	32	144
				32		200
1	10	32	6	4	4	24
			5	28	32	140
				32		164
1	10	32	4	23	23	92
			3	9	32	27
				32		119
1	10	32	3	14	14	42
			2	18	18	36
				32		78
1	10	32	2	6	6	12
			1	22	28	22
				28		34

*Note that the 5 WRH and 285 WSH for a SS of 57, as indicated in Table 5, have been subdivided between rooms with different Station Counts (200 and 100). Similar subdivisions are made throughout Table 7. An explanation of the reason for this is given in Step 3 of the text preceding Table 7.

†Data in this column are from Table 6.

‡Data in these columns are from Table 5.

4. Calculate the required Station Count (SC) by adjusting the tentatively assumed Station Count (SC) by application of the assumed Station Utilization Rate (SUR).

   These calculations are shown in Table 14.

   The first three columns of Table 14 are summarized from Table 13, the fourth column is taken from Table 12. The last two columns are calculated as shown.

TABLE 14

ADJUSTMENT OF TENTATIVELY ASSUMED CLASSROOM STATION COUNTS

(1)	(2)	(3)	(4)	(5)	(6)
Number of Rooms (R)	Tentatively Assumed Station Count (SC)	Weekly Student Hours (WSH)	Station Utilization Rate (SUR)	Number of Stations (N) (5)=(3)÷(4)	Calculated Station Count (SC) (6)=(5)÷(1)
1	200	2,222	11.0	202	202
1	100	1,361	14.3	95	95
1	60	1,224	16.8	73	73
3	40	3,008	18.0	167	56
18	30	13,287	21.0	633	35
17	20*	8,385	25.0	335	19*
9	10	1,713	19.2	89	10
Total 50	N/A	31,200	N/A	1,594	N/A

*Note that the calculated Station Count 19 is smaller than the tentatively assumed Station Count 20. This discrepancy is corrected in the next step by making the finally assigned Station Count 20, thereby obviating the need to make adjustments and reiterate the calculations in Step 3.

5. Assign the final Station Counts (SC) and check the Weekly Student Hour capacity (WSH_c) of the proposed distribution of classrooms.

   The data are presented in Table 15.

   The first column of Table 15 is brought forward from column 1 of Table 14. The second column of Table 15 represents an arbitrary rounding (to modular numbers) of column 6 in Table 14. The third column is the mathematical product of the first two. The fourth column is taken from column 4 of Table 12. The fifth column is the mathematical product of the third and fourth columns (WSH = N × SUR). The sixth column is summarized from Table 13 and is identical to the third column of Table 14.

TABLE 15

FINALLY ASSIGNED STATION COUNTS AND WEEKLY STUDENT HOUR CAPACITIES OF CLASSROOMS

(1)	(2)	(3)	(4)	(5)	(6)
				Weekly Student Hour Capacity Based Upon:	
Number of Rooms (R)	Finally Assigned Station Count (SC)	Total Stations (N) (3)=(1)x(2)	Station Utilization Rate (SUR)	Finally Assigned Station Count (WSH_c) (5)=(3)x(4)	Tentatively Assumed Station Count (WSH_c)
1	200	200	11.0	2,200	2,222
1	100	100	14.3	1,430	1,361
1	75	75	16.8	1,260	1,224
3	55	165	18.0	2,970	3,008
18	35	630	21.0	13,230	13,287
17	20	340	25.0	8,500	8,385
9	10	90	19.2	1,728	1,713
Total 50	N/A	1,600	N/A	31,318	31,200

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required Assignable Square Feet (ASF).

   These data are tabulated in Table 16.

TABLE 16

REQUIRED ASSIGNABLE SQUARE FEET IN CLASSROOMS AND CLASSROOM SERVICE

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Classroom Type	Finally Assigned Station Count (SC)	Number of Rooms (R)	Assignable Square Feet per Station* (ASF/N)	Assignable Square Feet per Room (ASF/R)	Total Stations (N)	Total Assignable Square Feet (ASF)
				(5)=(2)x(4)	(6)=(2)x(3)	(7)=(3)x(5)
Lecture	200	1	10	2,000	200	2,000
Lecture	100	1	12	1,200	100	1,200
General Purpose	75	1	14	1,050	75	1,050
General Purpose	55	3	14	770	165	2,310
General Purpose	35	9	16	560	315	5,040
Seminar	35	9	20	700	315	6,300
Seminar	20	17	25	500	340	8,500
Seminar	10	9	25	250	90	2,250
Subtotals	N/A	50	N/A	N/A	1,600	28,650
Projection Room	N/A	1	N/A	N/A	N/A	150
Total	N/A	51	N/A	N/A	1,600	28,800

*The Assignable Square Feet per Station in Table 16 are illustrative only and are not recommended as standards.

7. Compare the existing and projected numbers of classrooms (R) and Stations (N) to determine the required numbers of additional rooms and Stations.

   This comparison is shown in Table 17.

TABLE 17

REQUIRED ADDITIONAL CLASSROOMS AND STATIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Station Count	Number of Rooms (R)			Number of Stations (N)		
	Projected	Existing*	Required	Projected	Existing*	Required
			(4)=(2)−(3)			(7)=(5)−(6)
200	1	1	0	200	200	0
100	1	1	0	100	100	0
75	1	1	0	75	75	0
55	3	3	0	165	165	0
35	9	4	5	315	140	175
35	9	6	3	315	210	105
20	17	17	0	340	340	0
10	9	7	2	90	70	20
Total	50	40	10	1,600	1,300	300

*Note that in practice "existing" facilities may need to be adjusted to reflect the future abandonment of currently used classroom space.

8. Determine the additional number of classrooms (R) required, the Station Count (SC) in each room, and the Assignable Square Feet (ASF).

The required additional classroom facilities are summarized in Table 18.

TABLE 18

REQUIRED ADDITIONAL CLASSROOM FACILITIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Classroom Type	Station Count (SC)	Number of Rooms (R)	Assignable Square Feet per Station (ASF/N)	Assignable Square Feet per Room (ASF/R) (5)=(2)x(4)	Total Stations (N) (6)=(2)x(3)	Total Assignable Square Feet (ASF) (7)=(5)x(3)*
Classroom	35	5	16	560	175	2,800
Seminar	35	3	20	700	105	2,100
Seminar	10	2	25	250	20	500
Total	N/A	10	N/A	N/A	300	5,400
Classroom Service	N/A	N/A	N/A	N/A	N/A	None

*Also (7)= (4) x (6)

COMMENTS ON THE PROCEDURE

Note that this example makes no assumption about the quality of the existing classroom facilities. If some of the existing classroom space is of such poor quality that it will be abandoned or converted to other uses between the present time and the point in time to which the project or program data apply, then the "existing" facilities assumed in Step 7 should be adjusted to reflect only the classrooms which will still exist at the time assumed as the target year for the projected program data.

Section 2.2.

CLASSROOM

General Method A

INTRODUCTORY COMMENTS

General planning methods such as those described in the succeeding pages can be very useful. They can also be misused easily and therefore may be dangerous in the hands of the novice. The limitations of these general planning methods are so severe that their use should be restricted to those institutions which can monitor constantly the validity of the assumptions involved. When such validity can be assured, general planning methods serve as adequate rule-of-thumb estimates of overall classroom requirements. If, however, the application of general planning methods results in a decision to add, alter, or abandon existing classrooms, then these general estimates must be substantiated by a complete analysis as outlined in the preceding Detailed Method section.

General Method A relies entirely on averages and yields only total numbers. It does not indicate the interrelationship of these numbers. For example, it does not indicate how many classrooms of various Station Counts and corresponding numbers of Assignable Square Feet in each should be available. It assumes an Average Room Utilization Rate for all classrooms and an Average Station Occupancy Ratio for all Stations. In the evaluation of existing space it yields only the total Weekly Room Hour and total Weekly Student Hour capacity of existing classrooms; for projections of classroom requirements in a new institution it provides only the total numbers of rooms, Stations, and Assignable Square Feet; for projections of classroom requirements in an existing institution it provides only the total additional number of rooms, Stations, and Assignable Square Feet.

Section 2.2.1

General Method A

EVALUATION OF TOTAL EXISTING CLASSROOM CAPACITY

DISCUSSION

DATA TO BE DETERMINED

Total number of

►Weekly Student Hours (WSH) which existing classrooms can accommodate

PROGRAM DATA REQUIRED

None

FACILITIES DATA REQUIRED

►Total number of existing classrooms (R)
►Total number of existing classroom Stations (N)
►Total number of existing classroom Assignable Square Feet (ASF), including classroom service facilities

UTILIZATION ASSUMPTIONS REQUIRED

►Average Room Utilization Rate (AvRUR)
►Average Station Occupancy Ratio (AvSOR)
►Average Number of Assignable Square Feet per classroom Station [Av(ASF/N)], including classroom service facilities

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   ►Total number of existing classrooms (R)
   ►Total number of Stations (N) in existing classrooms
   ►Total Assignable Square Feet (ASF) in existing classrooms, including classroom service areas

2. Establish average utilization rates as a matter of institutional policy.

   ►Average Room Utilization Rate (AvRUR)
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including classroom service facilities

3. Determine the total number of Weekly Room Hours (WRH) which can be accommodated in existing classrooms.

   This Weekly Room Hour capacity (WRH_c) is the product of the number of rooms (R) and the Average Room Utilization Rate (AvRUR).

   Weekly Room Hour capacity = (Number of Rooms) x (Average Room Rate

   $$WRH_c = (R) \times (AvRUR)$$

4. Determine the total number of Weekly Student Hours (WSH) which can be accommodated in existing classrooms.

   This Weekly Student Hour capacity (WSH_c) is the product of the total Number of Stations (N) and the Average Station Utilization Rate (AvSUR):

$$\text{Weekly Student Hour capacity} = (\text{Number of Stations}) \times (\text{Average Station Utilization Rate})$$

$$WSH_c = (N) \times (AvSUR)$$

5. An alternate method for determining the total number of Weekly Student Hours which can be accommodated in existing classroom space involves the use of the ratio of Assignable Square Feet to Weekly Student Hours (ASF/WSH).

   In addition to an assumed Average Room Utilization Rate (AvRUR) and an assumed Average Station Occupancy Ratio (AvSOR), an Average Number of Assignable Square Feet per classroom Station [Av(ASF/N)], including classroom service areas, must be assumed. The ratio of Assignable Square Feet to Weekly Student Hours is derived as follows:

$$\text{Assignable Square Feet per Weekly Student Hour} = \frac{(\text{Average Assignable Square Feet per Station})}{(\text{Average Room Utilization Rate}) \times (\text{Average Station Occupancy Ratio})}$$

$$ASF/WSH = \frac{[Av(ASF/N)]}{(AvRUR) \times (AvSOR)} = \frac{[Av(ASF/N)]}{(AvSUR)}$$

   The number of Weekly Student Hours which a given number of Assignable Square Feet of classroom space can accommodate is then estimated by dividing the given number of square feet by the ASF/WSH ratio.

COMMENTS ON THE PROCEDURE

See the Introductory Comments on General Method A for the limitations of this procedure for analyzing classroom capacity (Section 2.2.).

Note also that this procedure makes no assumption about the quality of the classroom space. Classroom facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Step 1 of the Procedure.

Section 2.2.1

General Method A

EVALUATION OF TOTAL EXISTING CLASSROOM CAPACITY

EXAMPLE

DATA TO BE DETERMINED

Total number of

- ►Weekly Room Hours (WRH)
- ►Weekly Student Hours (WSH)

which existing classrooms can accommodate

PROCEDURE

1. Obtain the facilities data.

   ►Total number of existing classrooms = 40 classrooms
   ►Total number of existing Stations = 1,300 Stations
   ►Total Assignable Square Feet in existing classrooms, including classroom service facilities = 23,400 Assignable Square Feet

2. Establish average utilization rates as a matter of institutional policy.*

   ►Average Room Utilization Rate = 30 hours per week
   ►Average Station Occupancy Ratio = 0.65
   ►Average Number of Assignable Square Feet per classroom Station, including classroom service facilities = 17.5 Assignable Square Feet per Station

3. Determine the total number of Weekly Room Hours (WRH) which can be accommodated in existing classrooms.

$$\begin{aligned} WRH_e &= (R) \text{ x } (RUR) \\ &= (40) \text{ x } (30) \\ &= 1{,}200 \text{ Weekly Room Hours} \end{aligned}$$

4. Determine the total number of Weekly Student Hours (WSH) which can be accommodated in existing classrooms.

$$\begin{aligned} WSH_e &= (N) \text{ x } (SUR) \\ &= (1{,}300) \text{ x } (30 \text{ x } 0.65) \\ &= 25{,}350 \text{ Weekly Student Hours} \end{aligned}$$

---

*The utilization rates used in Step 2 are illustrative only and are not recommended as standards.

5. An alternative method for determining the total number of Weekly Student Hours which can be accommodated in existing classrooms employs the ratio of Assignable Square Feet to Weekly Student Hours.

$$WSH_e = \frac{(ASF)}{(ASF/WSH)}$$

Because:

$$ASF/WSH = \frac{[Av(ASF/N)]}{(AvRUR) \times (AvSOR)}$$

$$WSH_e = \frac{(ASF)}{[Av(ASF/N)]} \times (AvRUR) \times (AvSOR)$$

$$= \frac{23{,}400}{17.5} \times (3) \times (0.65)$$

$$= 26{,}000 \text{ Weekly Student Hours}$$

Note: *This alternative method yields a slightly greater WSH_e than the WSH_e in Step 4. This results from the existing [Av(ASF/N)] actually being 18.0 rather than the assumed value of 17.5.*

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for classrooms of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the facilities data in Step 1.

Section 2.2.2

General Method A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►The total number of classrooms (R)
►Total number of classroom Stations (N)
►Total classroom Assignable Square Feet, including classroom service facilities (ASF)

PROGRAM DATA REQUIRED

►Projected total classroom Weekly Room Hours (WRH)
►Projected total classroom Weekly Student Hours (WSH)

FACILITIES DATA REQUIRED

None

UTILIZATION ASSUMPTIONS REQUIRED

►Average Room Utilization Rate (AvRUR)
►Average Station Occupancy Ratio (AvSOR)
►Average Number of Assignable Square Feet per classroom Station [Av(ASF/N)], including classroom service facilities

PROCEDURE

1. Obtain the curricular program data.

►Total projected classroom Weekly Room Hours (WRH)
►Total projected classroom Weekly Student Hours (WSH)

These numbers may be available either from the detailed program planning procedures discussed in Manual Six or from other estimates.

For example, estimates of Weekly Student Hours can be based on an assumed average number of classroom Weekly Student Hours per FTE Student. If it is assumed that each FTE Student will average 13 scheduled hours per week in classrooms, then for a projected student body of 2,400 FTE Students there will be 31,200 Weekly Student Hours (WSH) of classroom instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE Students}) \times (\text{WSH per FTE Student}) \\ &= (2{,}400) \times (13) \\ &= 31{,}200 \text{ Weekly Student Hours} \end{aligned}$$

If it is further assumed that the Average Section Size (AvSS) will be 21 students, then there will be approximately 1,500 Weekly Room Hours (WRH).

$$\begin{aligned} \text{WRH} &= \frac{(\text{WRH})}{(\text{AvSS})} \\ &= \frac{(31{,}200)}{21} \\ &= 1{,}486 \text{ Weekly Room Hours (or rounded, } 1{,}500) \end{aligned}$$

2. Establish average utilization rates as a matter of institutional policy.

   ►Average Room Utilization Rate (AvRUR)
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including classroom service facilities

   For example, it might be assumed that, on the average, classrooms will be scheduled 30 hours per week, that the AvSOR will be 0.65, and that, on the average, each Station will require 18 Assignable Square Feet.

   For a more complete discussion of the range of utilization rates and Assignable Square Feet per Station see Section 2.4.

3. Determine the required number of rooms (R).

   This is the quotient obtained by dividing the total projected Weekly Room Hours (WRH) by the assumed Average Room Utilization Rate (AvRUR).

4. Determine the required number of Stations (N).

   This is the quotient obtained by dividing the total projected Weekly Student Hours (WSH) by the assumed Average Station Utilization Rate (AvSUR).

5. Determine the number of Assignable Square Feet (ASF) of classroom space required, including the related service facilities.

   This is the product of the number of Stations (N) and the assumed Average Assignable Square Feet per Station [Av(ASF/N)].

COMMENTS ON THE PROCEDURE

See the Introductory Comments concerning General Method A for the limitations of this procedure for projecting classroom requirements (Section 2.2.).

Section 2.2.2

General Method A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

- ►Total number of classrooms (R) required
- ►Total number of classroom Stations (N)
- ►Total classroom Assignable Square Feet (ASF), including classroom service facilities

PROCEDURE

1. Obtain the curricular program data.

   ►Total projected classroom Weekly Room Hours (WRH) = 1,500 hours
   ►Total projected classroom Weekly Student Hours (WSH) = 31,200 hours

2. Establish average utilization rates as a matter of institutional policy.*

   ►Average Room Utilization Rate = 30 hours per week

   ►Average Station Occupancy Ratio = 0.65

   ►Average Number of Assignable Square Feet per classroom Station, including classroom service facilities = 18 Assignable Square Feet per Station

3. Determine the required number of classrooms (R).

$$
\begin{aligned}
R &= (WRH) \div (AvRUR) \\
&= (1{,}500) \div (30) \\
&= 50 \text{ classrooms}
\end{aligned}
$$

4. Determine the required number of Stations (N).

$$
\begin{aligned}
N &= (WSH) \div (AvSUR) \\
&= (31{,}200) \div (19.5) \\
&= 1{,}600 \text{ Stations}
\end{aligned}
$$

The SUR in this example is derived from

$$
\begin{aligned}
AvSUR &= (AvRUR) \times (AvSOR) \\
&= (30) \times (0.65) \\
&= 19.5 \text{ hours per week}
\end{aligned}
$$

---

*The utilization rates used in Step 2 are illustrative only and are not recommended as standards.

5. Determine the number of Assignable Square Feet (ASF) of classroom space required.

ASF = (N) x [Av(ASF/N)]
= 1,600 x 18
= 28,800 Assignable Square Feet

Section 2.2.3

General Method A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Additional number of classrooms (R)
►Additional number of classroom Stations (N)
►Additional classroom Assignable Square Feet (ASF), including classroom service facilities

PROGRAM DATA REQUIRED

►Projected total classroom Weekly Room Hours (WRH)
►Projected total classroom Weekly Student Hours (WSH)

FACILITIES DATA REQUIRED

►Weekly Room Hour capacity (WRH_c) of existing classrooms (R)
►Weekly Student Hour capacity (WSH_c) of existing Stations (N)

UTILIZATION ASSUMPTIONS REQUIRED

►Average Room Utilization Rate (AvRUR)
►Average Station Occupancy Ratio (AvSOR)
►Average Number of Assignable Square Feet per classroom Station [Av(ASF/N)], including classroom service facilities

PROCEDURE

1. Obtain the curricular program data.

►Total projected classroom Weekly Room Hours (WRH)
►Total projected classroom Weekly Student Hours (WSH)

These numbers may be available either from the detailed program planning procedures discussed in Manual Six or from other estimates.

For example, estimates of Weekly Student Hours can be based on an assumed average number of classroom Weekly Student Hours per FTE Student. If it is assumed that each FTE Student will average 13 scheduled hours per week in classrooms, then for a projected student body of 2,400 FTE Students there will be 31,200 Weekly Student Hours (WSH) of classroom instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE Students}) \times (\text{WSH per FTE Student}) \\ &= (2{,}400) \times (13) \\ &= 31{,}200 \text{ Weekly Student Hours} \end{aligned}$$

If it is further assumed that the Average Section Size (AvSS) will be 21 students, then there will be approximately 1,500 Weekly Room Hours (WRH).

$$\begin{aligned} \text{WRH} &= \frac{(\text{WSH})}{(\text{AvSS})} \\ &= \frac{(31{,}200)}{21} \\ &= 1{,}486 \text{ Weekly Room Hours (or rounded, } 1{,}500) \end{aligned}$$

2. Establish average utilization rates as a matter of institutional policy.

   ►Average Room Utilization Rate (AvRUR)
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including classroom service facilities

   For example, it might be assumed that, on the average, classrooms will be scheduled 30 hours per week, that the AvSOR will be 0.65, and that, on the average, each Station will require 18 Assignable Square Feet.

   For a more complete discussion of the range of utilization rates and Assignable Square Feet per Station see Section 2.4.

3. Determine the additional number of classrooms (R) required.

   This is the difference between the total projected Weekly Room Hours (WRH) and the Weekly Room Hour capacity (WRH_c) of existing classrooms divided by the assumed Average Room Utilization Rate (AvRUR).

$$\text{Additional classrooms} = \frac{(\text{Total Projected WRH}) - (\text{Existing } WRH_c)}{(\text{AvRUR})}$$

   A method for calculating WRH_c is discussed in Section 2.2.1.

4. Determine the additional number of Stations (N) required.

   This is the difference between the total projected Weekly Student Hours (WSH) and the Weekly Student Hour capacity (WSH_c) of existing classroom Stations (N) divided by the assumed Average Station Utilization Rate (AvSUR).

$$\text{Additional Stations} = \frac{(\text{Total Projected WSH}) - (\text{Existing } WSH_c)}{(\text{AvSUR})}$$

   A method of calculating WSH_c is discussed in Section 2.2.1.

5. Determine the additional number of Assignable Square Feet of classroom space required.

   This is the product of the number of additional Stations (N) and the assumed Average Number of Assignable Square Feet per Station [Av(ASF/N)], including classroom service space.

$$\text{Additional ASF} = (\text{Additional N}) \times [\text{Av(ASF/N)}]$$

COMMENTS ON THE PROCEDURE

See the Introductory Comments on General Method A for limitations of this procedure in projecting additional classroom requirements (Section 2.2.).

Note that this procedure makes no assumption about the quality of existing classroom space. Classroom facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Step 1 of the Procedure in Section 2.2.1.

Section 2.2.3

General Method A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

- ►Additional number of classrooms (R)
- ►Additional number of Stations (N)
- ►Additional Assignable Square Feet (ASF), including classroom service facilities

PROCEDURE

1. Obtain the curricular program data.

   ►Total projected classroom Weekly Room Hours (WRH) = 1,500 hours

   ►Total projected classroom Weekly Student Hours (WSH) = 31,200 hours

2. Establish average utilization rates as a matter of institutional policy.*

   ►Average Room Utilization Rate = 30 hours per week

   ►Average Station Occupancy Ratio = 0.65

   ►Average Number of Assignable Square Feet per Station, including classroom service facilities = 18 Assignable Square Feet per Station

3. Determine the additional number of classrooms required (R).

$$\text{Additional classrooms} = \frac{(\text{Total Projected WRH}) - (\text{Existing WRH}_e)}{(\text{AvRUR})}$$

$$= \frac{1{,}500 - 1{,}200^{**}}{30}$$

$$= 10 \text{ additional classrooms}$$

4. Determine the additional number of Stations required (N).

$$\text{Additional Stations} = \frac{(\text{Total Projected WSH}) - (\text{Existing WSH}_e)}{(\text{AvSUR})}$$

$$= \frac{31{,}200 - 25{,}350^{***}}{19.5}$$

$$= 300 \text{ additional Stations}$$

---

*The utilization rates used in Step 2 are illustrative only and are not recommended as standards.

**The existing WRH_e of 1,200 was determined in the Example in Section 2.2.1 (Step 3).

***The existing WSH_e of 25,350 hours was determined in the Example in Section 2.2.1 (Step 4).

5. Determine the additional number of Assignable Square Feet of classroom space required.

$$\begin{aligned}\text{Additional ASF} &= (\text{Additional N}) \times [\text{Av(ASF/N)}]\\ &= 300 \times 18\\ &= 5{,}400 \text{ Assignable Square Feet}\end{aligned}$$

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for classrooms of such poor quality that hey should be abandoned. Where such an adjustment is necessary, it should be relected in the existing facilities data in Step 1 of the Example in Section 2.2.1.

Section 2.3.

CLASSROOM

General Method B

INTRODUCTORY COMMENTS

The general planning method described on succeeding pages can be very useful in certain limited applications. It can also be applied inappropriately and therefore may be very dangerous in the hands of the novice. This method depends entirely on the validity of a single average number and yields only one rough-estimate answer. When the validity of the average can be demonstrated, the result has some utility as a rough estimate. Ultimately, however, the evaluation and projection of classroom requirements should take the form of the analysis outlined in the Detailed Method (Section 2.1.).

General Method B uses Assignable Square Feet per FTE Student as its only criterion. For the evaluation of existing space, Method B yields an estimate of the number of FTE Students who can be accommodated in the existing classroom space. For projecting classroom space in a new institution, it provides only an estimate of the total Assignable Square Feet required. For projecting classroom space in an existing institution, it provides only an estimate of the total additional Assignable Square Feet required.

Section 2.3.1

General Method B

EVALUATION OF THE CAPACITY OF EXISTING CLASSROOM ASSIGNABLE SQUARE FEET

DISCUSSION

DATA TO BE DETERMINED

- ►Total number of FTE Students (FTE Sn) for which the existing classrooms can accommodate the classroom instruction

PROGRAM DATA REQUIRED

None

FACILITIES DATA REQUIRED

- ►Total* Assignable Square Feet (ASF) in existing classrooms
- ►Average number of total* classroom Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)]

PROCEDURE

1. Obtain the total* Assignable Square Feet (ASF) in existing classrooms.
2. Establish, on the basis of institutional practice, the required average number of total* classroom Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].
3. Determine the total number of FTE Students for which the existing classrooms can accommodate the classroom instruction.

   This is the quotient obtained by dividing the existing total classroom Assignable Square Feet by the assumed average number of total classroom Assignable Square Feet required per FTE Student.

COMMENTS ON THE PROCEDURE

See the Introductory Comments concerning General Method B for the limitations of this procedure in evaluating the capacity of existing classroom space (see Section 2.3.).

Note that this procedure makes no assumption about the quality of existing classroom space. The Assignable Square Feet of classroom facilities which are of such poor quality that they should no longer be used ought to be subtracted from the total ASF assumed in Step 1.

---

*"Total" implies the inclusion of classroom service facilities Assignable Square Feet.

Section 2.3.1

General Method B

EVALUATION OF THE CAPACITY OF EXISTING CLASSROOM ASSIGNABLE SQUARE FEET

EXAMPLE

DATA TO BE DETERMINED

►Total number of FTE Students (FTE Sn) for which the existing classrooms can accommodate the classroom instruction

PROCEDURE

1. Obtain the total* Assignable Square Feet (ASF) in existing classrooms, including classroom service facilities.

   Total* classroom ASF = 23,400 Assignable Square Feet

2. Establish, on the basis of institutional practice, the required average number of total* classroom Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].**

   Average classroom ASF/FTE Sn = 12 Assignable Square Feet per FTE Student

3. Determine the total number of FTE Students for which the existing classrooms can accommodate the classroom instruction.

$$\begin{aligned} \text{FTE Sn} &= (\text{ASF}) \div [\text{Av}(\text{ASF/FTE Sn})] \\ &= (23{,}400) \div (12) \\ &= 1{,}950 \text{ FTE Students} \end{aligned}$$

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for classrooms of such poor quality that they should be abandoned. Where such an adjustment is necessary, such classrooms should be excluded from the existing facilities assumed in Step 1.

---

*"Total" implies the inclusion of classroom service facilities Assignable Square Feet.

**The Average Number of Assignable Square Feet per FTE Student used in Step 2 is illustrative only and is not recommended as a standard.

Section 2.3.2

General Method B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Total* Assignable Square Feet (ASF) of classroom space required

PROGRAM DATA REQUIRED

►Projected total FTE Students (FTE Sn)

FACILITIES DATA REQUIRED

None

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of total* classroom Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)]

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).
2. Establish, as an institutional goal or on the basis of external criteria, the average number of total* classroom Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)].
3. Determine the total* Assignable Square Feet (ASF) of classroom space required.

   This is the product of the projected total FTE Students and the assumed average number of total* classroom Assignable Square Feet required per FTE Student.

COMMENTS ON THE PROCEDURE

See the Introductory Comments on General Method B for the limitations of this procedure in projecting classroom Assignable Square Feet (Section 2.3.).

---

*"Total" implies the inclusion of classroom service facilities Assignable Square Feet.

Section 2.3.2

General Method B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED ►Total* Assignable Square Feet (ASF) of classroom space required

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).

   FTE Sn = 2,400 FTE Students

2. Establish, as an institutional goal or on the basis of external criteria, the average number of total* classroom Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].**

   Average classroom ASF/FTE Sn = 12 Assignable Square Feet per FTE Student

3. Determine the total* Assignable Square Feet (ASF) of classroom space required.

   Total* classroom ASF = (FTE Sn) x [Av(ASF/FTE Sn)]
   = (2,400) x (12)
   = 28,800 Assignable Square Feet

---

*"Total" implies the inclusion of classroom service facilities Assignable Square Feet.

**The Average Number of Assignable Square Feet per FTE Student used in Step 2 is illustrative only and is not recommended as a standard.

Section 2.3.3

General Method B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Additional total* Assignable Square Feet (ASF) of classroom space required

PROGRAM DATA REQUIRED

►Projected total FTE Students (FTE Sn)

FACILITIES DATA REQUIRED

►Total* Assignable Square Feet (ASF) in existing classrooms

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of total* classroom Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)]

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).
2. Establish, as an institutional goal or on the basis of external criteria, the average number of total* classroom Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)].
3. Determine the total* Assignable Square Feet (ASF) of classroom space required.

   This is the product of the projected total FTE Students and the assumed average number of total* classroom Assignable Square Feet required per FTE Student.
4. Determine the number of additional total* classroom Assignable Square Feet (ASF) required between the present and the projected year.

   This is the difference between the existing and projected numbers of Assignable Square Feet.

COMMENTS ON THE PROCEDURE

See the Introductory Comments on General Method B for the limitations of this procedure in projecting additional classroom Assignable Square Feet (Section 2.3.).

Note also that this procedure makes no assumptions about the quality of existing classroom space. The Assignable Square Feet of classroom facilities which are of such poor quality that they should no longer be used ought to be subtracted from the ASF assumed in Step 4.

---

*"Total" implies the inclusion of classroom service facilities Assignable Square Feet.

Section 2.3.3

General Method B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

►Additional total* Assignable Square Feet (ASF) of classroom space required

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).

   FTE Sn = 2,400 FTE Students

2. Establish, as an institutional goal or on the basis of external criteria, the average number of total* classroom Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)].**

   Average classroom ASF/FTE Sn = 12 Assignable Square Feet per FTE Student

3. Determine the total* Assignable Square Feet (ASF) of classroom space required

   Total* classroom ASF = (FTE Sn) x [Av(ASF/FTE Sn)]
   = (2,400) x (12)
   = 28,800 Assignable Square Feet

4. Determine the number of additional total* classroom Assignable Square Feet (ASF) required between the present and the projected year.

   Additional classroom ASF = (Projected ASF) − (Existing ASF)
   = (28,800) − (23,400)
   = 5,400 Assignable Square Feet

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for classroom Assignable Square Feet of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the existing ASF data assumed in Step 4.

---

*"Total" implies the inclusion of classroom service facilities Assignable Square Feet.

**The Average Number of Assignable Square Feet per FTE Student used in Step 2 is illustrative only and is not recommended as a standard.

Section 2.4.

CLASSROOM UTILIZATION AND UNIT FLOOR AREA CRITERIA

ROOM TYPE

Classroom and classroom service

UTILIZATION CRITERIA

In the evaluation and the projection of classroom requirements, two measures of utilization are used: a Room Utilization Rate and a Station Occupancy Ratio. It is important to recognize that these are not independent measures. Frequently an increase in the Room Utilization Rate occurs at the expense of the Station Occupancy Ratio. Consider, for example, a one-Section course of 30 students meeting in a room with 30 Stations. If one more student enrolls in that course and it is divided into two Sections of 15 and 16 students, then the Room Utilization Rate is doubled but the Station Occupancy Ratio is cut nearly in half.

In general, a lower Room Utilization Rate may be appropriate for the classrooms with the largest Station Counts. No generalization concerning Room Utilization Rates in the smallest classrooms seems to be warranted.

Usually, the Station Occupancy Ratio is most likely to reach its maximum value for rooms whose Station Counts approximate the Average Section Size. In most instances, the Station Occupancy Ratio can be expected to decrease as the Station Count becomes larger or smaller than the Average Section Size.

Although no absolute numbers can be recommended for any group of institutions, typical assumed Average Room Utilization Rates might range from 20 to 32 hours per week, and assumed Average Station Occupancy Ratios from 0.45 to 0.85 hours per week. No values can be recommended for individual classrooms for they can legitimately have a wide range.

UNIT FLOOR AREA CRITERIA

Classroom furniture varies in its design and dimensions. In planning new facilities or in the replacement of furniture in existing facilities, it is important to choose first the kind of classroom furniture required and then make dimensioned layouts of actual furniture arrangements in the classroom.

As generalized planning guides, the following ranges of classroom unit area criteria may be useful. It should be noted that different room shapes, seating configurations, and amounts of circulation space within the classroom affect these unit area allowances.

TABLE 19

CLASSROOM ASSIGNABLE SQUARE FEET PER STATION CRITERIA

(1)	(2)	(3)	(4)	(5)	(6)
Station Count	Assignable Square Feet per Station				
	Tables and Chairs	Armchair Desks		Auditorium Seating	
		Small	Large	Theatre	Continental
5-9	20-30	20	30	—	—
10-19	20-30	18	22	—	—
20-29	20-30	16	20	—	—
30-39	20-25	15	18	—	—
40-49	18-22	14	16	—	—
50-59	18-22	14	16	—	—
60-99	18-22	13	15	10-14	18-22
100-149	16-20	11	14	9-12	16-20
150-299	16-20	10	14	8-10	14-18
300+	16-18	9	12	7-10	14-18

Section 3.

CLASS LABORATORY

INTRODUCTORY COMMENTS

ROOM TYPES INCLUDED

Class laboratories and their related service rooms. Included in this category are rooms generally referred to as *teaching laboratories, instructional shops, typing laboratories, drafting rooms, band rooms, choral rooms, (group) music practice rooms, language laboratories, (group) studios,* and similar specially designed and/or equipped rooms **if** they are used primarily for group instruction in regularly scheduled classes.

DISCUSSION

Because a class laboratory typically is designed for a particular course or group of courses it usually is assigned to the control of a department or similar organizational unit. Unlike a classroom, a class laboratory is not considered to be an institutionwide resource.

Because a class laboratory can serve more than one group of students, it usually is scheduled on a formal basis.

Three methods of evaluating or projecting class laboratory requirements are discussed here:

- ►A detailed method is developed by which class laboratory requirements may be determined on a room-by-room basis for each Laboratory Type in each department.*
- ►A general method is described by which class laboratory requirements may be determined only on an overall basis (total numbers of class laboratories, Stations, and Assignable Square Feet) for each department.*
- ►Another general method is presented by which class laboratory requirements may be determined only on the basis of total Assignable Square Feet.

Each of these three methods is discussed and illustrated under three conditions:

- ►Evaluation techniques are applied to existing class laboratories to assess their capacity to accommodate an instructional program.
- ►Projection techniques are applied to the instructional program of a new institution to determine its class laboratory requirements.
- ►Projection techniques are applied to the instructional program of an existing institution to determine its additional class laboratory requirements.

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*The word "department" is used in the typical academic sense of an organizational unit of a college or university. "Laboratory Type" defines the facility resource necessary for scheduled instruction in a given course or group of courses. An example of a department is chemistry; an example of a Laboratory Type is an (advanced) organic chemistry class laboratory. The particular subclassifications of class laboratories used in the manual in describing and illustrating evaluative and projection techniques are not the only ones which might be used. For example, some institutions are not organized on a departmental basis; in this case the term "course grouping" might be used instead. Some institutions may wish to further subdivide Laboratory Type into course levels (lower undergraduate, upper undergraduate, graduate), but the concept of Laboratory Type as used in this manual is assumed to be broad enough to encompass such subclassifications.

Section 3.1.

Detailed Method

CLASS LABORATORY

INTRODUCTORY COMMENTS

The detailed method described and illustrated in the following pages is a procedure recommended for use when the evaluation and projection of class laboratory requirements must be determined as specifically as possible.

The procedure assumes the availability of very detailed data. In some instances institutions may need to modify the procedure because data of the required level of detail are not available. The procedure is designed to permit such modification; however, it must be recognized that the validity of the results may be affected when less specific data are used.

Both the evaluation and the projection of class laboratory facilities require two utilization assumptions: a Room Utilization Rate and a Station Occupancy Ratio. It is a fundamental thesis of this procedure that utilization criteria specific to each class laboratory (or at least to all class laboratories of the same Laboratory Type) should be used rather than averages applied to all class laboratories in a department or total institution.

In most institutions there is ample justification for less intensive scheduled use of some Laboratory Types (within or among departments) than in others. In general, variations in instructional methodologies may be expected to affect the values set for the assumed Room Utilization Rates more than the assumed Station Occupancy Ratios. The values set for Station Occupancy Ratios are more likely to be influenced by course level. Generally the assumed Station Occupancy Ratios may be set at higher values for lower-level, multi-Sectioned laboratory courses but at lower values for upper-level laboratory courses with only a small number of Sections.

In addition to these utilization assumptions, the evaluation of existing class laboratory capacity requires a detailed inventory of existing class laboratory facilities. On the basis of the utilization assumptions and inventory data of existing class laboratory facilities, the procedure yields estimates of the number of Weekly Room Hours and Weekly Student Hours which existing class laboratories of each Laboratory Type can accommodate. It should be noted that this procedure differs from the typical class laboratory utilization study. Typical utilization studies generally have been limited to expression of the average use made of all class laboratories (or the Stations in them). For many reasons (discussed in Section 4.) not all class laboratories can be used equally effectively. It is therefore appropriate to use different utilization criteria for various departments and class Laboratory Types. Typical utilization studies have also been generally limited to hindsight. It seems more useful to evaluate the capacity of each class laboratory (or Laboratory Type) to support an instructional program than to discover that the totality did or did not do the job efficiently.

The projection of class laboratory requirements requires, in addition to the utilization assumptions described above, detailed distributions of class laboratory Weekly Room Hours and Weekly Student Hours by Laboratory Type. (The methodology for determining these data is discussed in Manual Six.)* From these program data and utilization assumptions it is possible to project the required number of class laboratories of each Laboratory Type.

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*Note that the curricular program data must be collected and summarized on a basis consistent with the requirements of the evaluation and projection of facilities. In most instances there is a one-to-one relationship between course (chemistry), the department (chemistry) responsible for providing instruction in the course, and the Laboratory Type (chemistry) in which the course is taught. Where such a one-to-one relationship does not exist, care must be taken to assure that the Weekly Room Hour and Weekly Student Hour data are summarized by the Laboratory Type in which the instruction will occur and by the department to which the class laboratory will be assigned.

Section 3.1.1

Detailed Method

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DISCUSSION

DATA TO BE DETERMINED

For each Laboratory Type,* the number of

- ►Weekly Room Hours (WRH)
- ►Weekly Student Hours (WSH)

which existing class laboratories (of each Station Count) can accommodate**

PROGRAM DATA REQUIRED

For each Laboratory Type

- ►Number of existing class laboratories (R)
- ►Station Count (SC) in each existing class laboratory
- ►Assignable Square Feet (ASF) in each existing class laboratory

For each department

- ►Assignable Square Feet (ASF) of existing class laboratory service facilities

UTILIZATION ASSUMPTIONS REQUIRED

For each Laboratory Type

- ►Room Utilization Rate (RUR)
- ►Station Occupancy Ratio (SOR)

PROCEDURE

1. Obtain the facilities data for each Laboratory Type from the facilities inventory.
   - ►Number of existing class laboratories (R)
   - ►Station Count (SC) for each existing class laboratory
   - ►Assignable Square Feet (ASF) for each existing class laboratory
   - ►Assignable Square Feet (ASF) of existing class laboratory service facilities
2. Establish utilization rates for each Laboratory Type as a matter of institutional policy.
   - ►Room Utilization Rate (RUR)
   - ►Station Occupancy Ratio (SOR)

   In certain instances it may even be desirable to develop utilization criteria for individual class laboratories of the same Laboratory Type.
3. Determine for each Laboratory Type the number of Weekly Room Hours (WRH) which can be accommodated in existing class laboratories.

   This Weekly Room Hour capacity (WRH_c) is the product of the number of rooms (R) of each Laboratory Type and the Room Utilization Rate (RUR) for that Laboratory Type.

---

*The procedure as developed here assumes that the several Laboratory Types are also categorized by the department to which they are assigned.

**In order to keep the procedure and examples reasonably simple, all class laboratories of a given Laboratory Type are assumed to have the same Station Count.

Weekly Room Hour capacity = (Number of Rooms) x (Room Utilization Rate)

WRH_c = (R) x (RUR)

For example, if it is assumed that four first-year biology laboratories (Laboratory Type A) can be scheduled for use 22 hours per week and two advanced biology laboratories (Laboratory Type C) can be scheduled only 20 hours, then

Biology Type A WRH_c = (4) x (22)
= 88 Weekly Room Hours

Biology Type C WRH_c = (2) x (20)
= 40 Weekly Room Hours

4. Determine for each Laboratory Type the number of Weekly Student Hours (WSH) which can be accommodated in existing class laboratories.

This Weekly Student Hour capacity (WSH_c) is the product of the number of Stations (N) in all class laboratories of a given Laboratory Type and the Station Utilization Rate (SUR) for that Laboratory Type.

Weekly Room Hour capacity = (Number of Stations) x (Station Utilization Rate)

WSH_c = (N) x (SUR)

For example, if it is assumed that four first-year biology laboratories (Laboratory Type A), each with 25 stations, can be scheduled 22 hours per week (Room Utilization Rate) with 0.80 of the Stations occupied when each room is scheduled (Station Occupancy Ratio), and that two advanced biology laboratories (Laboratory Type C), each with 20 Stations, can be scheduled 20 hours per week with a 0.60 Station Occupancy Ratio, then

Biology Laboratory Type A WSH_c = (4 x 25) x (22 x 0.80)*
= 1,760 Weekly Student Hours

Biology Laboratory Type C WSH_c = (2 x 20) x (20 x 0.60)*
= 480 Weekly Student Hours

COMMENTS ON THE PROCEDURE

The procedure outlined above makes no assumption about the quality of the existing class laboratory space. If some existing class laboratory space is of such poor quality that it can no longer be used, then that adjustment should be reflected in Step 1 of the procedure. For each Laboratory Type, the number of rooms, number of Stations, and the Assignable Square Feet of class laboratory and class laboratory service space should be reduced by the numbers and amounts which will no longer be used. Note that the procedure does allow for the limited use of certain rooms by permitting specific Room and Station Utilization Rates to be applied to specific class laboratories.

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*WSH_c = N x SUR = (R x SC) x (RUR x SOR)

Section 3.1.1

Detailed Method

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

EXAMPLE

DATA TO BE DETERMINED For each Laboratory Type, the number of

- ►Weekly Room Hours (WRH)
- ►Weekly Student Hours (WSH)

which existing class laboratories (of each Station Count) can accommodate

PROCEDURE

1. Obtain the facilities data for each Laboratory Type from the facilities inventory.

   - ►The number of existing class laboratories (R)
   - ►Station Count (SC) for each existing class laboratory
   - ►Assignable Square Feet (ASF) of existing class laboratory
   - ►Assignable Square Feet (ASF) of existing class laboratory service facilities

   These data are tabulated in Table 20.

TABLE 20

INVENTORY OF EXISTING CLASS LABORATORIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Department	Laboratory Type	Type of Room (R)	Number of Rooms (N)	Station Count (SC)	Assignable Square Feet Each Room (LASF/R)	Total Stations (N)	Total Assignable Square Feet
						(7)=(4)x(5)	(8)=(4)x(6)
Biology	A	Lab	4	25	900	100	3,600
Biology	C	Lab	2	20	1,000	40	2,000
Biology		Service	N/A	N/A	N/A	N/A	1,120
Zoology	A	Lab	1	35	1,050	35	1,050
Zoology	B	Lab	1	25	1,050	25	1,050
Zoology		Service	N/A	N/A	N/A	N/A	780
Chemistry	A	Lab	2	30	1,080	60	2,160
Chemistry	B	Lab	2	20	800	40	1,600
Chemistry	C	Lab	2	20	1,040	40	2,080
Chemistry		Service	N/A	N/A	N/A	N/A	3,280
Geology	A	Lab	1	30	1,080	30	1,080
Geology	B	Lab	1	30	1,320	30	1,320
Geology		Service	N/A	N/A	N/A	N/A	480
Physics	A	Lab	2	30	1,200	60	2,400
Physics	B	Lab	1	25	1,200	25	1,200
Physics	C	Lab	1	15	900	15	900
Physics		Service	N/A	N/A	N/A	N/A	2,700

2. Establish utilization rates for each Laboratory Type as a matter of institutional policy.

   ►Room Utilization Rate (RUR)
   ►Station Occupancy Ratio (SOR)

   These utilization rates are shown in Table 21.

TABLE 21

ASSUMED CLASS LABORATORY UTILIZATION RATES FOR EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)
Department	Laboratory Type	Assumed Room Utilization* Rate (RUR)	Assumed Station Occupancy Ratio (SOR)	Assumed Station Utilization Rate (SUR) (5)=(3)x(4)
Biology	A	22	0.80	17.6
Biology	C	20	0.60	12.0
Zoology	A	20	0.80	16.0
Zoology	B	20	0.80	16.0
Chemistry	A	20	0.85	17.0
Chemistry	B	20	0.60	12.0
Chemistry	C	20	0.60	12.0
Geology	A	25	0.64	16.0
Geology	B	25	0.64	16.0
Physics	A	25	0.80	20.0
Physics	B	21	0.80	16.8
Physics	C	20	0.60	12.0

*The utilization rates displayed in Table 21 are illustrative only and are not recommended as standards.

3. Determine the number of Weekly Room Hours (WRH) for each Laboratory Type which can be accommodated in existing class laboratories.

   The Weekly Room Hour capacity (WRH_c) of class laboratories of each Laboratory Type is shown in Table 22.

TABLE 22

WEEKLY ROOM HOUR CAPACITY OF EXISTING CLASS LABORATORIES OF EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)
Department	Laboratory Type	Number of Rooms (R)	Room Utilization Rate (RUR)*	Weekly Room Hour Capacity (WRH_c) (5)=(3)x(4)
Biology	A	4	22	88
Biology	C	2	20	40
Zoology	A	1	20	20
Zoology	B	1	20	20
Chemistry	A	2	20	40
Chemistry	B	2	20	40
Chemistry	C	2	20	40
Geology	A	1	25	25
Geology	B	1	25	25
Physics	A	2	25	50
Physics	B	1	21	21
Physics	C	1	20	20

*Note that in this example the same RUR is applied to all class laboratories within a Laboratory Type. While this is the typical assumption used, it is nevertheless possible, and in some instances may be appropriate, to apply different RUR criteria to each class laboratory within a Laboratory Type.

4. Determine the number of Weekly Student Hours (WSH) for each Laboratory Type which can be accommodated in existing class laboratories.

   The Weekly Student Hour capacity (WSH_c) of class laboratories of each Laboratory Type is shown in Table 23.

TABLE 23

WEEKLY STUDENT HOUR CAPACITY OF EXISTING CLASS LABORATORIES OF EACH LABORATORY TYPE

(1) Department	(2) Laboratory Type	(3) Total Stations* (N)	(4) Assumed Station Utilization Rate** (SUR)	(5) Weekly Student Hour Capacity (WSH_c) (5)=(3)x(4)
Biology	A	100	17.6	1,760
Biology	C	40	12.0	480
Zoology	A	35	16.0	560
Zoology	B	25	16.0	400
Chemistry	A	60	17.0	1,020
Chemistry	B	40	12.0	480
Chemistry	C	40	12.0	480
Geology	A	30	16.0	480
Geology	B	30	16.0	480
Physics	A	60	20.0	1,200
Physics	B	25	16.8	420
Physics	C	15	12.0	180

*From Table 20
**From Table 21

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for class laboratory facilities of such poor quality that they should be abandoned. In such cases those facilities should be excluded from the data in Steps 1, 3, and 4.

Section 3.1.2

Detailed Method

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

For each Laboratory Type*

►Number of class laboratories (R)
►Station Count (SC) for each class laboratory
►Assignable Square Feet for each class laboratory (LASF)

For each department**

►Assignable Square Feet of class laboratory service (LsASF) facilities

PROGRAM DATA REQUIRED

►Projected class laboratory Weekly Room Hours (WRH) distributed by Section Size (SS) for each Laboratory Type
►Projected class laboratory Weekly Student Hours (WSH) distributed by Section Size (SS) for each Laboratory Type

These distributions are derived from projected course enrollments for each Laboratory Type distributed by class laboratory Section Size and number of class laboratory hours of instruction required per Section.

FACILITIES DATA REQUIRED

None

UTILIZATION ASSUMPTIONS REQUIRED

For each Laboratory Type

►Room Utilization Rate (RUR)
►Station Occupancy Ratio (SOR)
►Number of Assignable Square Feet per Station (LASF/N)

PROCEDURE

1. Obtain the curricular program data for each Laboratory Type from the program planning procedure (discussed in Manual Six).

   ►Weekly Room Hours (WRH) by Section Size (SS)
   ►Weekly Student Hours (WSH) by Section Size (SS)

2. Establish utilization rates for each Laboratory Type as a matter of institutional policy.

   ►Room Utilization Rate (RUR)
   ►Station Occupancy Ratio (SOR)

   In certain instances it may even be desirable to develop utilization criteria for individual class laboratories of the same Laboratory Type.

---

*The procedure as developed here assumes that the several Laboratory Types are also categorized by the department to which they are assigned.

**In order to simplify the procedure, class laboratory service facilities are assumed to be a departmental resource servicing all class laboratories rather than individual Laboratory Types.

Method X

3X. Determine the total number of Stations (N) required for each Laboratory Type to accommodate the projected Weekly Student Hours (WSH).

This is the quotient obtained by dividing the projected Weekly Student Hours (WSH) by the assumed Station Utilization Rate (SUR).

$$\text{Number of Stations} = (\text{Weekly Student Hours}) \div (\text{Station Utilization Rate})$$

$$N = (WSH) \div (SUR)$$

Method Y

The number of Stations may be determined on another basis. It is usually the case that the capacity for a class laboratory (or a group of similar ones) is set on the basis of an instructional decision concerning the maximum laboratory Section Size. Thus the number of Stations can be determined by use of the projected Average Section Size and the Station Occupancy Ratio rather than by use of the WSH/SUR ratio.

3Y. Determine the Station Count (SC) required for each Laboratory Type to accommodate the projected Average Section Size (AvSS).

$$\text{Station Count} = (\text{Projected Average Section Size}) \div (\text{Assumed Station Occupancy Ratio})$$

$$= (AvSS) \div (SOR)$$

Although this alternate method (Method Y) can be shown to be *mathematically equivalent* to the WSH/SUR Method (Method X), it may produce *numerically different* results because of the sequence of the calculations. For a more complete discussion of the two methods see the Essay on the Interrelationship of Utilization Assumptions (Section 3.6. of this manual).

4. Determine the required number of rooms (R) for each Laboratory Type.

This is the quotient obtained by dividing the projected Weekly Room Hours (WRH) by the assumed Room Utilization Rate (RUR).

$$\text{Number of Rooms} = (\text{Weekly Room Hours}) \div (\text{Room Utilization Rate})$$

$$R = (WRH) \div (RUR)$$

5. Decide the final projected number of rooms of each Station Count for each Laboratory Type, determine the design criteria, and then calculate the required laboratory Assignable Square Feet (LASF). For all class laboratory space in a department, determine the laboratory service Assignable Square Feet (LsASF).

These calculations may be made on two bases, as illustrated in the example. The two methods reflect the alternate ways of calculating student Station requirements presented in Steps 3X and 3Y.

Note that an alternative method sometimes used to project the Assignable Square Feet of class laboratory space including related service space is the use of a single value for Assignable Square Feet per Station which provides sufficient space for both class laboratory space and the related service space.

COMMENTS ON THE PROCEDURE

The Station Count in each class laboratory may be determined by either of two procedures. Most commonly it is derived from an academic decision concerning the maximum laboratory Section Size (SS) appropriate to each course. In this case the number of Stations (N) in each class laboratory is derived by dividing the Average Section Size (AvSS) by the assumed Station Occupancy Ratio (SOR). Alternatively, the total number of Stations (N) required can be calculated by dividing total Weekly Student Hours (WSH) by the assumed Station Utilization Rate (SUR). Both methods involve an assumed Station Occupancy Ratio (SOR). In one instance the Station Occupancy Ratio (SOR) is used directly; in the other instance it is involved as a factor of the Station Utilization Rate because SUR = (RUR) x (SOR).

In determining the Station Occupancy Ratio (SOR) for each Laboratory Type three objectives must be kept in mind:

- **Room utilization criteria** assume optimum utilization of each room. A particular class laboratory must accommodate not only Sections equal in size to the number of Stations but also Sections of lesser numbers. Not until an optimum level of room utilization is reached does the level of Station utilization become significant.

- **Differences among and within courses, course levels, and departments** suggest that different Station Occupancy Ratios be applied to various Laboratory Types. Some courses, for example, may enroll relatively few students. The distribution of those few students among several Sections may result in Section Sizes considerably smaller than the number of Stations in the laboratory and consequently in low Station Occupancy Ratios. Conversely, the class laboratories for courses with larger projected enrollments may be expected to have higher Station Occupancy Ratios.

- **Scheduling principles** require that some excess seating capacity be available. Single-Section laboratory courses, or even those with limited numbers of Sections, make it difficult for a student to develop a conflict-free schedule. The provision of sufficient Sections to reduce scheduling conflicts may lower Section Sizes and consequently the Station Occupancy Ratio.

The required number of class laboratories is determined by applying the assumed Room Utilization Rate to the projected Weekly Room Hours for each Laboratory Type. Because it is assumed generally that a single maximum Station Count will apply to all laboratories of a given type, there may not be a range of class laboratory Station Counts as there is in the case of classrooms. (Typically, when additional class laboratories are required, they are designed with the same Station Count. The decision to build additional class laboratories results from a determination that both the Room Utilization Rate and the Station Occupancy Ratio have reached their optimum levels.)

In determining class laboratory Room Utilization Rates, one major consideration must be kept in mind. Differences among and within academic programs suggest that different Room Utilization Rates are appropriate for various class laboratories. One of the major determinants in setting a level of room use is the amount of nonscheduled or informal use. An introductory geology course, for instance, may involve no "extra class" use of the laboratory. An architecture course may require much more nonscheduled use of the laboratory than is required for formal course instruction. Because the assumed Room Utilization Rate is based only on the regularly scheduled use of the class laboratory, the Room Utilization Rate can be higher in the case of limited nonscheduled use and should be lower when considerable nonscheduled use is typical.

The Assignable Square Feet for each laboratory is a design problem based on the kind and extent of laboratory equipment as well as the internal circulation space. Wide variations exist among the various Laboratory Types. For example, a Station in a biology laboratory requires much less space than a Station in an automotive engineering laboratory. Differences may also occur within a department. For example, a Station in introductory chemistry typically requires much less space than a Station for advanced organic chemistry.

In the development of Assignable Square Feet per Station criteria for class laboratories, it is a generally accepted practice to include the related class laboratory service space. For example, a value of 50 Assignable Square Feet per Station in general chemistry includes not only the class laboratory facilities, but also the related balance room(s), stock room(s), and so on. In the following example it is assumed that laboratory service space serves all of the class laboratories of a particular department. For instance, it is assumed that the laboratory service space for chemistry serves all Laboratory Types in chemistry.

Section 3.1.2

Detailed Method

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED For each Laboratory Type

- ►Number of class laboratories (R)
- ►Station Count (SC) for each class laboratory
- ►Assignable Square Feet for each class laboratory (LASF)

For each Department

- ►Assignable Square Feet of class laboratory service facilities (LsASF)

PROCEDURE

1. Obtain the curricular program data for each Laboratory Type from the program planning procedure (discussed in Manual Six).

   - ►Weekly Room Hours (WRH) by Section Size (SS)
   - ►Weekly Student Hours (WSH) by Section Size (SS)

   These data are tabulated in Table 24.

TABLE 24

PROJECTED WEEKLY ROOM HOURS AND WEEKLY STUDENT HOURS IN CLASS LABORATORIES BY SECTION SIZE FOR EACH DEPARTMENT AND LABORATORY TYPE

Biology								
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B			Laboratory Type C		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
25	8	200	20	4	80	20	4	80
24	8	192	19	8	152	16	4	64
23	16	368	17	4	68	13	4	52
22	16	352	16	4	64	12	8	96
21	16	336	15	4	60	11	4	44
20	8	160	14	8	112	10	8	80
19	8	152	13	8	104	8	8	64
Total	80	1,760	Total	40	640	Total	40	480

TABLE 24 (continued)

Zoology

(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
32	4	128	23	4	92
29	4	116	20	8	160
27	4	108	19	4	76
26	8	208	18	4	72
Total	20	560	Total	20	400

Chemistry

(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B			Laboratory Type C		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
30	4	120	19	4	76	17	8	136
29	8	232	17	4	68	16	8	128
27	8	216	15	8	120	15	8	120
26	16	416	14	8	112	13	4	52
25	16	400	13	8	104	11	4	44
24	16	384						
23	8	184						
22	4	88						
Total	80	2,040	Total	32	480	Total	32	480

Geology

(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
24	4	96	22	8	176
21	4	84	21	4	84
20	4	80	20	4	80
19	4	76	19	4	76
18	8	144	16	4	64
Total	24	480	Total	24	480

TABLE 24 (continued)

Physics

(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B			Laboratory Type C		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
28	5	140	24	5	120	14	3	42
27	5	135	21	5	105	12	3	36
26	5	130	20	5	100	9	6	54
24	10	240	19	5	95	8	6	48
23	10	230						
22	10	220						
21	5	105						
Total	50	1,200	Total	20	420	Total	18	180

2. Establish utilization rates for each Laboratory Type as a matter of institutional policy.

   ►Room Utilization Rate (RUR)
   ►Station Occupancy Ratio (SOR)

   These utilization rates are indicated in Table 25.

TABLE 25

ASSUMED CLASS LABORATORY UTILIZATION RATES* FOR EACH LABORATORY TYPE

(1) Department	(2) Laboratory Type	(3) Assumed Room Utilization Rate (RUR)	(4) Assumed Station Occupancy Ratio (SOR)	(5 Assumed Station Utilization Rate (SUR) (5)=(3)x(4)
Biology	A	22	0.80	17.6
Biology	B	20	0.80	16.0
Biology	C	20	0.60	12.0
Zoology	A	20	0.80	16.0
Zoology	B	20	0.80	16.0
Chemistry	A	20	0.85	17.0
Chemistry	B	20	0.60	12.0
Chemistry	C	20	0.60	12.0
Geology	A	25	0.64	16.0
Geology	B	25	0.64	16.0
Physics	A	25	0.80	20.0
Physics	B	21	0.80	16.8
Physics	C	20	0.60	12.0

*The utilization rates shown in Table 25 are illustrative only and are not recommended as standards.

Method X

X. Determine the total number of Stations (N) required for each Laboratory Type to accommodate the projected Weekly Student Hours (WSH).

The required number of Stations are indicated in Table 26.

TABLE 26

REQUIRED NUMBER OF STATIONS FOR EACH LABORATORY TYPE

(1) Department	(2) Laboratory Type	(3) Weekly Student Hours (WSH)	(4) Station Utilization Rate (SUR)	(5) Number of Stations (N) (5)=(3)÷(4)
Biology	A	1,760	17.6	100
Biology	B	640	16.0	40
Biology	C	480	12.0	40
Zoology	A	560	16.0	35
Zoology	B	400	16.0	25
Chemistry	A	2,040	17.0	120
Chemistry	B	480	12.0	40
Chemistry	C	480	12.0	40
Geology	A	480	16.0	30
Geology	B	480	16.0	30
Physics	A	1,200	20.0	60
Physics	B	420	16.8	25
Physics	C	180	12.0	15

Method Y

3Y. Determine the Station Count (SC) required for each Laboratory Type to accor modate the projected Average Section Size (AvSS).

The required Station Counts are indicated in Table 27.

TABLE 27

REQUIRED STATION COUNT FOR EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Department	Laboratory Type	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Average Section Size (AvSS)	Station Occupancy Rates (SOR)	Station Count (SC) (7)=(5)÷(6)
Biology	A	80	1,760	22	0.80	27.50
Biology	B	40	640	16	0.80	20.00
Biology	C	40	480	12	0.60	20.00
Zoology	A	20	560	28	0.80	35.00
Zoology	B	20	400	20	0.80	25.00
Chemistry	A	80	2,040	25.5	0.85	30.00
Chemistry	B	32	480	15	0.60	25.00
Chemistry	C	32	480	15	0.60	25.00
Geology	A	24	480	20	0.64	31.25
Geology	B	24	480	20	0.64	31.25
Physics	A	50	1,200	24	0.80	30.00
Physics	B	20	420	21	0.80	26.25
Physics	C	18	180	10	0.60	16.67

4. Determine the required number of rooms (R) for each Laboratory Type.

The required number of rooms are indicated in Table 28.

TABLE 28

REQUIRED NUMBER OF CLASS LABORATORIES FOR EACH LABORATORY TYPE

(1) Department	(2) Laboratory Type	(3) Weekly Room Hours (WRH)	(4) Assumed Room Utilization Rate (RUR)	(5) Fractional Number of Rooms (R_f) (5)=(3)÷(4)	(6) Number of Rooms (R)
Biology	A	80	22	3.64	4
Biology	B	40	20	2.00	2
Biology	C	40	20	2.00	2
Zoology	A	20	20	1.00	1
Zoology	B	20	20	1.00	1
Chemistry	A	80	20	4.00	4
Chemistry	B	32	20	1.60	2
Chemistry	C	32	20	1.60	2
Geology	A	24	25	0.96	1
Geology	B	24	25	0.96	1
Physics	A	50	25	2.00	2
Physics	B	20	21	0.95	1
Physics	C	18	20	0.90	1

5. Decide the final projected number of rooms of each Station Count (SC) for each Laboratory Type, determine the design criteria, and then calculate the require laboratory Assignable Square Feet (LASF).

   These data are tabulated in Table 29.

TABLE 29

REQUIRED ASSIGNABLE SQUARE FEET IN CLASS LABORATORIES AND CLASS LABORATORY SERVICE FACILITIES

Biology				
(1)	(2)	(3)	(4)	(5)
	Laboratory Types			
Procedure	A	B	C	Total
METHOD X				
R	4	2	2	8 *
N	100	40	40	180 *
SC	25	20	20	22.5**
LASF/N	36	40	50	40 ***
LASF/R = SC x LASF/N	900	800	1,000	900 ****
LASF = R x LASF/R	3,600	1,600	2,000	7,200 *
LsASF/N	N/A	N/A	N/A	8
LsASF = N x LsASF/N	N/A	N/A	N/A	1,440
ASF = LASF + LsASF	N/A	N/A	N/A	8,640
METHOD Y				
R	4	2	2	8 *
N	110	40	40	190 *
SC	27.5	20	20	23.75**
LASF/N	36	40	50	41+ ***
LASF/R = SC x LASF/N	1,050	800	1,000	975 ****
LASF = R x LASF/R	4,200	1,600	2,000	7,800 *
LsASF/N	N/A	N/A	N/A	8
LsASF = N x LsASF/N	N/A	N/A	N/A	1,520
ASF = LASF + LsASF	N/A	N/A	N/A	9,320
Zoology				
METHOD X = METHOD Y				
R	1	1		2†
N	35	25		60†
SC	35	25		30**
LASF/N	30	42		35***
LASF/R = SC x LASF/N	1,050	1,050		1,050****
LASF = R x LASF/R	1,050	1,050		2,100†
LsASF/N	N/A	N/A		13
LsASF = N x LsASF/N	N/A	N/A		780
ASF = LASF + LsASF	N/A	N/A		2,880

*Sum of columns (2) + (3) + (4)
†Sum of columns (2) + (3)
**Average SC
***Average LASF/N
****Average LASF/R

TABLE 29 (continued)

(1)	(2)	(3)	(4)	(5)
		Laboratory Types		
Procedure	A	B	C	Total
Chemistry				
METHOD X				
R	4	2	2	8*
N	120	40	40	200*
SC	30	20	20	25**
LASF/N	36	40	52	40***
LASF/R = SC x LASF/N	1,080	800	1,040	1,000****
LASF = R x LASF/R	4,320	1,600	2,080	8,000*
LsASF/N	N/A	N/A	N/A	20
LsASF = N x LsASF/N	N/A	N/A	N/A	4,000
ASF = LASF + LsASF	N/A	N/A	N/A	12,000
METHOD Y				
R	4	2	2	8 *
N	120	50	50	220 *
SC	30	25	25	27.50 **
LASF/N	36	40	52	40.5 †***
LASF/R = SC x LASF/N	1,080	1,000	1,300	1,115 ****
LASF = R x LASF/R	4,320	2,000	2,600	8,920 *
LsASF/N	N/A	N/A	N/A	20
LsASF = N x LsASF/N	N/A	N/A	N/A	4,400
ASF = LASF + LsASF	N/A	N/A	N/A	13,320
Geology				
METHOD X				
R	1	1		2†
N	30	30		60†
SC	30	30		30**
LASF/N	36	44		40***
LASF/R = SC x LASF/N	1,080	1,320		1,200****
LASF = R x LASF/R	1,080	1,320		2,400†
LsASF/N	N/A	N/A		8
LsASF = N x LsASF/N	N/A	N/A		480
ASF = LASF + LsASF	N/A	N/A		2,880
METHOD Y				
R	1	1		2†
N	32	32		64†
SC	31.25	31.25		32**
LASF/N	36	44		39†***
LASF/R = SC x LASF/N	1,125	1,375		1,250****
LASF = R x LASF/R	1,125	1,375		2,500†
LsASF/N	N/A	N/A		8
LsASF = N x LsASF/N	N/A	N/A		512
ASF = LASF + LsASF	N/A	N/A		3,012

*Sum of columns (2) + (3) + (4)
†Sum of columns (2) + (3)
**Average SC
***Average LASF/N
****Average LASF/R

TABLE 29 (continued)

Physics

(1)	(2)	(3)	(4)	(5)
	Laboratory Types			
Procedure	A	B	C	Total
METHOD X				
R	2	1	1	4*
N	60	25	15	100*
SC	30	25	15	25**
LASF/N	40	40	60	45***
LASF/R = SC x LASF/N	1,200	1,200	900	1,125****
LASF = R x LASF/R	2,400	1,200	900	4,500*
LsASF/N	N/A	N/A	N/A	27
LsASF = N x LsASF/N	N/A	N/A	N/A	2,700
ASF = LASF + LsASF	N/A	N/A	N/A	7,200
METHOD Y				
R	2	1	1	4 *
N	60	27	17	104 *
SC	30.00	26.25	16.67	26 **
LASF/N	40	48	60	44.8+***
LASF/R = SC x LASF/N	1,200	1,260	1,000	1,165 ****
LASF = R x LASF/R	2,400	1,260	1,000	4,660 *
LsASF/N	N/A	N/A	N/A	27
LsASF = N x LsASF/N	N/A	N/A	N/A	2,908
ASF = LASF + LsASF	N/A	N/A	N/A	7,568

*Sum of columns (2) + (3) + (4)
**Average SC
***Average LASF/N
****Average LASF/R

Section 3.1.3

Detailed Method

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

For each Laboratory Type*

- ►Additional number of class laboratories (R)
- ►Station Count (SC) for each additional class laboratory
- ►Assignable Square Feet (ASF) for each additional class laboratory (L)

For each department**

- ►Assignable Square Feet (ASF) of additional class laboratory service (Ls) facilities

PROGRAM DATA REQUIRED

- ►Projected class laboratory Weekly Room Hours (WRH) distributed by Section Size (SS) for each Laboratory Type
- ►Projected class laboratory Weekly Student Hours (WSH) distributed by Section Size (SS) for each Laboratory Type

These distributions are derived from projected course enrollments for each Laboratory Type, distributed by class laboratory Section Size and number of class laboratory hours of instruction required per Section.

FACILITIES DATA REQUIRED

For each Laboratory Type

- ►Number of existing class laboratories (R)
- ►Station Count (SC) in each existing class laboratory
- ►Assignable Square Feet (ASF) in each existing class laboratory (L)

For each department

- ►Assignable Square Feet (ASF) of existing class laboratory service (Ls) facilities

UTILIZATION ASSUMPTIONS REQUIRED

For each Laboratory Type

- ►Room Utilization Rate (RUR)
- ►Station Occupancy Ratio (SOR)
- ►Number of Assignable Square Feet per Station (ASF/N)

---

*The procedure as developed here assumes that the several Laboratory Types are also categorized by the department to which they are assigned.

**In order to simplify the procedures, class laboratories service facilities are assumed to be a departmental resource servicing all class laboratories rather than individual Laboratory Types.

PROCEDURE

1. Obtain the curricular program data for each Laboratory Type from the program planning procedure (discussed in Manual Six).

   ►Weekly Room Hours (WRH) by Section Size (SS)
   ►Weekly Student Hours (WSH) by Section Size (SS)

2. Establish utilization rates for each Laboratory Type as a matter of institutional policy.

   ►Room Utilization Rate (RUR)
   ►Station Occupancy Ratio (SOR)

   In certain instances it may even be desirable to develop utilization criteria for individual class laboratories of the same Laboratory Type.

Method X

3X. Determine the total number of Stations (N) required for each Laboratory Type to accommodate the projected Weekly Student Hours (WSH).

This is the quotient obtained by dividing the projected Weekly Student Hours (WSH) by the assumed Station Utilization Rate (SUR).

$$\text{Number of Stations} = (\text{Weekly Student Hours}) \div (\text{Station Utilization Rate})$$

$$N = (WSH) \div (SUR)$$

Method Y

The number of Stations may be determined on another basis. It is usually the cas that the capacity for a class laboratory (or a group of similar ones) is set on the basis of an instructional decision concerning the maximum laboratory Section Size. Hence, the number of Stations can be determined by use of the projected Average Section Size and the Station Occupancy Ratio rather than by use of the WSH/SUR ratio.

3Y. Determine the Station Count (SC) required for each Laboratory Type to accommodate the projected Average Section Size (AvSS).

$$\begin{aligned}\text{Station Count} &= (\text{Projected Average Section Size}) \div (\text{Assumed Station Occupancy Ratio}) \\ &= (AvSS) \div (SOR)\end{aligned}$$

Although this alternate method (Method Y) can be shown to be *mathematically equivalent* to the WSH/SUR Method (Method X), it may produce *numericall different* results because of the sequence of the calculations. For a more complete discussion of the two methods see the Essay on the Interrelationship of Utilization Assumptions (Section 3.6. of this manual).

4. Determine the required number of rooms (R) for each Laboratory Type.

This is the quotient of the projected Weekly Room Hours (WRH) by the assumed Room Utilization Rate (RUR).

$$\text{Number of Rooms} = (\text{Weekly Room Hours}) \div (\text{Room Utilization Rate})$$

$$R = (WRH) \div (RUR)$$

5. Compare the existing with the projected distribution of rooms (R) and number of Stations for each Laboratory Type.

It is possible that the results of this analysis may indicate the need for additional Stations, but not for additional rooms. This situation requires an evaluation of all basic assumptions and a decision. The decision might be to

- ►Not add Stations, thereby increasing utilization rates
- ►Add Stations to existing rooms, thereby reducing the number of Assignable Square Feet per Station
- ►Add Stations in a new room, thereby lowering utilization rates

For a discussion of the effect of the alternate methods of calculating Stations see the Essay on the Interrelationship of Utilization Assumptions (Section 3.6. of this manual).

6. Decide the additional class laboratories of each Station Count required for each Laboratory Type, determine the design criteria, and then calculate the additional laboratory Assignable Square Feet (LASF). For all class laboratory space in a department, determine the additional laboratory service Assignable Square Feet (LsASF).

These calculations may be made on two bases as illustrated in the following example. The two new methods reflect the alternate ways of calculating student Station requirements.

Note that an alternative method sometimes used to project the Assignable Square Feet of class laboratory space including related service facilities is the use of a single value for Assignable Square Feet per Station which provides sufficient space for both class laboratory space and the related service space.

COMMENTS ON THE PROCEDURE

See the Comments on the Procedure following Step 5 in Section 3.1.2 of this manual.

Note also that the procedure outlined above makes no assumption about the quality of the existing class laboratory facilities. If some of the existing class laboratory space is of such poor quality that it will be abandoned or converted to other uses between the present time and the point in time to which the projected program data apply, then the existing facilities assumed in Step 5 should be adjusted to reflect only the class laboratories which will still exist at the time assumed as the target year for the projected program data.

Section 3.1.3

Detailed Method

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

For each Laboratory Type

- ►Additional number of class laboratories (R)
- ►Station Count (SC) for each additional class laboratory
- ►Assignable Square Feet (ASF) for each additional class laboratory (L)

For each department

- ►Assignable Square Feet (ASF) of additional class laboratory service (Ls) facilities

PROCEDURE

1. Obtain the curricular program data for each Laboratory Type from the program planning procedure (discussed in Manual Six).

   - ►Weekly Room Hours (WRH) by Section Size (SS)
   - ►Weekly Student Hours (WSH) by Section Size (SS)

   These data are tabulated in Table 30.

TABLE 30

PROJECTED WEEKLY ROOM HOURS AND WEEKLY STUDENT HOURS IN CLASS LABORATORIES BY SECTION SIZE FOR EACH DEPARTMENT AND LABORATORY TYPE

Biology								
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B			Laboratory Type C		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
25	8	200	20	4	80	20	4	80
24	8	192	19	8	152	16	4	64
23	16	368	17	4	68	13	4	52
22	16	352	16	4	64	12	8	96
21	16	336	15	4	60	11	4	44
20	8	160	14	8	112	10	8	80
19	8	152	13	8	104	8	8	64
Total	80	1,760	Total	40	640	Total	40	480

TABLE 30 (continued)

Zoology

(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
32	4	128	23	4	92
29	4	116	20	8	160
27	4	108	19	4	76
26	8	208	18	4	72
Total	20	560	Total	20	400

Chemistry

(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B			Laboratory Type C		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
30	4	120	19	4	76	17	8	136
29	8	232	17	4	68	16	8	128
27	8	216	15	8	120	15	8	120
26	16	416	14	8	112	13	4	52
25	16	400	13	8	104	11	4	44
24	16	384						
23	8	184						
22	4	88						
Total	80	2,040	Total	32	480	Total	32	480

Geology

(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
24	4	96	22	8	176
21	4	84	21	4	84
20	4	80	20	4	80
19	4	76	19	4	76
18	8	144	16	4	64
Total	24	480	Total	24	480

Table 30 (continued)

Physics

(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Laboratory Type A			Laboratory Type B			Laboratory Type C		
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
28	5	140	24	5	120	14	3	42
27	5	135	21	5	105	12	3	36
26	5	130	20	5	100	9	6	54
24	10	240	19	5	95	8	6	48
23	10	230						
22	10	220						
21	5	105						
Total	50	1,200	Total	20	420	Total	18	180

2. Establish utilization rates for each Laboratory Type as a matter of institutional policy.

►Room Utilization Rate (RUR)
►Station Occupancy Ratio (SOR)

These utilization rates are indicated in Table 31.

Table 31

Assumed Class Laboratory Utilization Rates* for Each Laboratory Type

(1) Department	(2) Laboratory Type	(3) Assumed Room Utilization Rate (RUR)	(4) Assumed Station Occupancy Ratio (SOR)	(5 Assumed Station Utilization Rate (SUR) (5)=(3)x(4)
Biology	A	22	0.80	17.6
Biology	B	20	0.80	16.0
Biology	C	20	0.60	12.0
Zoology	A	20	0.80	16.0
Zoology	B	20	0.80	16.0
Chemistry	A	20	0.85	17.0
Chemistry	B	20	0.60	12.0
Chemistry	C	20	0.60	12.0
Geology	A	25	0.64	16.0
Geology	B	25	0.64	16.0
Physics	A	25	0.80	20.0
Physics	B	21	0.80	16.8
Physics	C	20	0.60	12.0

*The utilization rates displayed in Table 31 are illustrative only and are not recommended as standards.

Method X

X. Determine the total number of Stations (N) required for each Laboratory Type to accommodate the projected Weekly Student Hours (WSH).

The required number of Stations are indicated in Table 32.

TABLE 32

REQUIRED NUMBER OF STATIONS FOR EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)
Department	Laboratory Type	Weekly Student Hours (WSH)	Station Utilization Rate (SUR)	Number of Stations (N) (5)=(3)÷(4)
Biology	A	1,760	17.6	100
Biology	B	640	16.0	40
Biology	C	480	12.0	40
Zoology	A	560	16.0	35
Zoology	B	400	16.0	25
Chemistry	A	2,040	17.0	120
Chemistry	B	480	12.0	40
Chemistry	C	480	12.0	40
Geology	A	480	16.0	30
Geology	B	480	16.0	30
Physics	A	1,200	20.0	60
Physics	B	420	16.8	25
Physics	C	180	12.0	15

Method Y

3Y. Determine the Station Count (SC) required for each Laboratory Type to accon modate the projected Average Section Size (AvSS).

The required Station Counts are indicated in Table 33.

TABLE 33

REQUIRED STATION COUNT FOR EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Department	Laboratory Type	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)	Average Section Size (AvSS)	Station Occupancy Rates (SOR)	Station Count (SC) (7)=(5)÷(6)
Biology	A	80	1,760	22	0.80	27.50
Biology	B	40	640	16	0.80	20.00
Biology	C	40	480	12	0.60	20.00
Zoology	A	20	560	28	0.80	35.00
Zoology	B	20	400	20	0.80	25.00
Chemistry	A	80	2,040	25.5	0.85	30.00
Chemistry	B	32	480	15	0.60	25.00
Chemistry	C	32	480	15	0.60	25.00
Geology	A	24	480	20	0.64	31.25
Geology	B	24	480	20	0.64	31.25
Physics	A	50	1,200	24	0.80	30.00
Physics	B	20	420	21	0.80	26.25
Physics	C	18	180	10	0.60	16.67

4. Determine the required number of rooms (R) for each Laboratory Type.

The required number of rooms are indicated in Table 34.

TABLE 34

REQUIRED NUMBER OF CLASS LABORATORIES FOR EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)	(6)
Department	Laboratory Type	Weekly Room Hours (WRH)	Assumed Room Utilization Rate (RUR)	Fractional Number of Rooms (R_f) (5)=(3)÷(4)	Number of Rooms (R)
Biology	A	80	22	3.64	4
Biology	B	40	20	2.00	2
Biology	C	40	20	2.00	2
Zoology	A	20	20	1.00	1
Zoology	B	20	20	1.00	1
Chemistry	A	80	20	4.00	4
Chemistry	B	32	20	1.60	2
Chemistry	C	32	20	1.60	2
Geology	A	24	25	0.96	1
Geology	B	24	25	0.96	1
Physics	A	50	25	2.00	2
Physics	B	20	21	0.95	1
Physics	C	18	20	0.90	1

5. Compare the existing with the projected distributions of rooms (R) and number of Stations (N) for each Laboratory Type.

This comparison is shown in Table 35.

TABLE 35

REQUIRED ADDITIONAL CLASS LABORATORIES AND STATIONS FOR EACH LABORATORY TYPE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total Number of Rooms				Total Number of Stations					
Department	Laboratory Type	Projected	Existing	Required (5)=(3)−(4)	Projected	Method X Existing	Required (8)=(6)−(7)	Projected	Method Y Existing	Required (11)=(9)−(10)
Biology	A	4	4	0	100	100	0	110	100	10*
Biology	B	2	0	2	40	0	40	40	0	40
Biology	C	2	2	0	40	40	0	40	40	0
Zoology	A	1	1	0	35	35	0	35	35	0
Zoology	B	1	1	0	25	25	0	25	25	0
Chemistry	A	4	2	2	120	60	60	120	60	60
Chemistry	B	2	2	0	40	40	0	50	40	10*
Chemistry	C	2	2	0	40	40	0	50	40	10*
Geology	A	1	1	0	30	30	0	32	30	2*
Geology	B	1	1	0	30	30	0	32	30	2*
Physics	A	2	2	0	60	60	0	60	60	0
Physics	B	1	1	0	25	25	0	27	25	2*
Physics	C	1	1	0	15	15	0	17	15	2*
Total		24	20	4	600	500	100	638	500	138

*Note that in certain instances under Method Y additional Stations but not additional rooms are required for some specialties. See the Essay on the Interrelationship of Utilization Assumptions (Section 3.6. of this manual). Note also that in practice "existing" numbers of rooms and Stations may need to be adjusted to reflect the future abandonment of currently used class laboratory space.

6. Decide the additional class laboratories of each Station Count required for each Laboratory Type, determine the design criteria, and then calculate the laboratory Assignable Square Feet (LASF). For all class laboratory space in a department, determine the laboratory service Assignable Square Feet (LsASF).

The additional class laboratory requirements are summarized in Table 36 and the class laboratory service requirements in Table 37.

TABLE 36

REQUIRED ASSIGNBLE SQUARE FEET* OF ADDITIONAL CLASS LABORATORIES BY LABORATORY TYPE

(1)	(2)	(3)
	Department	
	Biology Laboratory Type B	Chemistry Laboratory Type A
R	2	2
N	40	60
LASF/N	40	36
LASF = N x LASF/N	1,600	2,160

*The Assignable Square Feet per Station figures in Table 36 are illustrative only and are not recommended as standards.

TABLE 37

REQUIRED ASSIGNABLE SQUARE FEET* OF ADDITIONAL CLASS LABORATORY SERVICE FACILITIES BY DEPARTMENT

(1)	(2)	(3)
	Department	
	Biology	Chemistry
Existing Stations	140	140
Added Stations	40	60
Total Stations	180	200
LsASF/N	8	20
LsASF — Total	1,440	4,000
LsASF — Existing	1,120	3,280
LsASF — Additional	320	720

*The Assignable Square Feet per Station figures in Table 37 are illustrative only and are not recommended as standards.

Section 3.2.

Class Laboratory

GENERAL METHOD A

INTRODUCTORY COMMENTS

General planning methods such as those described in succeeding pages can be very useful. They can also be misused easily and therefore may be dangerous in the hands of the novice. The limitations of these general planning methods are so severe that their use should be restricted to those institutions which can monitor constantly the validity of the assumptions involved. When such validity can be assured, general planning methods serve as adequate rule-of-thumb estimates of overall class laboratory requirements. If, however, the application of general planning methods results in a decision to add, alter, or abandon existing class laboratories, then these general estimates must be substantiated by a complete analysis as outlined in the preceding Detailed Method section.

General Method A relies entirely on averages and yields only total numbers for each department. It does not indicate the interrelationship of these numbers. For example, it does not indicate how many class laboratories of each Laboratory Type and corresponding numbers of Assignable Square Feet in each should be available. It assumes an Average Room Utilization Rate for all class laboratories within a department and an Average Station Occupancy Ratio for all Stations within a department. For the evaluation of existing space it yields only the total Weekly Room Hour and total Weekly Student Hour capacity for class laboratories in each department. For projections of class laboratory requirements in a new institution, it provides only the total number of rooms, Stations, and Assignable Square Feet required for each department. For projections of class laboratory requirements in an existing institution, it provides only the total additional number of rooms, Stations, and Assignable Square Feet required for each department.

Section 3.2.1

General Method A

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DISCUSSION

DATA TO BE DETERMINED

For each department, total number of

- Weekly Room Hours (WRH)
- Weekly Student Hours (WSH)

which existing class laboratories can accommodate

PROGRAM DATA REQUIRED

None

FACILITIES DATA REQUIRED

For each department

- Total number of existing class laboratories (R)
- Total number of existing class laboratory Stations (N)
- Total number of existing class laboratory Assignable Square Feet (LASF)
- Total number of existing class laboratory service facilities Assignable Square Feet (LsASF)

UTILIZATION ASSUMPTIONS REQUIRED

For each department

- Average Room Utilization Rate (AvRUR)
- Average Station Occupancy Ratio (AvSOR)
- Average Number of Assignable Square Feet per Station [Av(ASF/N)], including laboratory service facilities

PROCEDURE

1. Obtain the facilities data for each department from the facilities inventory.
   - Total number of existing class laboratories (R)
   - Total number of existing class laboratory Stations (N)
   - Total number of existing class laboratory Assignable Square Feet (LASF)
   - Total number of existing class laboratory service facilities Assignable Square Feet (LsASF)
2. Establish average utilization rates for each department as a matter of institutional policy.
   - Average Room Utilization Rate (AvRUR)
   - Average Station Occupancy Ratio (AvSOR)
   - Average number of Assignable Square Feet per Station [Av(ASF/N)], including related laboratory service facilities

3. Determine the number of Weekly Room Hours (WRH) for each department which can be accommodated in existing class laboratories.

   This Weekly Room Hour capacity (WRH_c) is the product of the number of rooms (R) and the Average Room Utilization Rate (AvRUR).

$$\text{Weekly Room Hour capacity} = (\text{Number of rooms}) \times (\text{Average RUR})$$

$$WRH_c = (R) \times (AvRUR)$$

4. Determine the total number of Weekly Student Hours (WSH) for each department which can be accommodated in existing class laboratories.

   This Weekly Student Hour capacity (WSH_c) is the product of the total number of Stations (N) and the Average Station Utilization Rate (AvSUR).

$$\text{Weekly Student Hour capacity} = (\text{Number of Stations}) \times (\text{Average Station Utilization Rate})$$

$$WSH_c = (N) \times (AvSUR)^{*}$$

5. An alternate method for determining the total number of Weekly Student Hours (WSH) which can be accommodated in existing class laboratory space involves the use of the ratio of Assignable Square Feet to Weekly Student Hours (ASF/WSH).

   In addition to an assumed Average Room Utilization Rate (AvRUR) and an assumed Average Station Occupancy ratio (AvSOR), an Average Number of Assignable Square Feet per class laboratory Station [Av(ASF/N)] (including class laboratory service facilities) must be assumed for each department. The ratio of Assignable Square Feet to Weekly Student Hours (ASF/WSH) is derived as follows:

$$\text{Assignable Square Feet per Weekly Student Hour} = \frac{(\text{Average Assignable Square Feet per Station}}{(\text{Average Room Utilization Rate}) \times (\text{Average Station Occupancy Ratio})}$$

$$ASF/WSH = \frac{[Av(ASF/N)]}{(AvRUR) \times (AvSOR)} = \frac{[Av(ASF/N)]}{(AvSUR)}$$

   The number of Weekly Student Hours which the class laboratory and related service Assignable Square Feet in a department can accommodate is then estimated by dividing those square feet by the ASF/WSH ratio.

COMMENTS ON THE PROCEDURE

See the Introductory Comments on General Method A for the limitations of this procedure for analyzing class laboratory capacity (Section 3.2.).

Note that this procedure makes no assumption about the quality of the existing class laboratory space. Class laboratory facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Step 1 of this procedure.

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*(AvSUR) = (AvRUR) x (AvSOR)

Section 3.2.1

General Method A

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

EXAMPLE

DATA TO BE DETERMINED

For each department, total number of

- ►Weekly Room Hours (WRH)
- ►Weekly Student Hours (WSH)

which existing class laboratories can accommodate

PROCEDURE

1. Obtain the facilities data for each department.

   These data are tabulated in Table 38.

TABLE 38

INVENTORY OF EXISTING CLASS LABORATORIES

(1) Department	(2) Type of Room	(3) Number of Rooms (R)	(4) Total Stations (N)	(5) Total Assignable Square Feet (ASF)
Biology	Lab	6	140	5,600
	Service	N/A	N/A	1,120
	Total	N/A	N/A	6,720
Zoology	Lab	2	60	2,100
	Service	N/A	N/A	780
	Total	N/A	N/A	2,880
Chemistry	Lab	6	140	5,840
	Service	N/A	N/A	3,280
	Total	N/A	N/A	9,120
Geology	Lab	2	60	2,400
	Service	N/A	N/A	480
	Total	N/A	N/A	2,880
Physics	Lab	4	100	4,500
	Service	N/A	N/A	2,700
	Total	N/A	N/A	7,200

2. Establish average utilization rates for each department as a matter of institutional policy.

- ►Average Room Utilization Rate (AvRUR)
- ►Average Station Occupancy Ratio (AvSOR)
- ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including related laboratory service facilities

These average utilization rates are illustrated in Table 39.

TABLE 39

ASSUMED AVERAGE CLASS LABORATORY UTILIZATION RATES* FOR EACH DEPARTMENT

(1)	(2)	(3)	(4)	(5)
Department	Average Room Utilization Rate (AvRUR)	Average Station Occupancy Ratio (AvSOR)	Average Station Utilization Rate (AvSUR) (4)=(2)x(3)	Average Square Feet per Station** [Av(ASF/N)]
Biology	20	0.80	16	48
Zoology	20	0.80	16	48
Chemistry	20	0.75	15	60
Geology	25	0.64	16	48
Physics	24	0.75	18	72

*These utilization rates are illustrative only and are not recommended as standards.
**Including class laboratory service areas.

3. Determine the number of Weekly Room Hours (WRH) for each department which can be accommodated in existing class laboratories.

The Weekly Room Hours capacities (WRH_c) of class laboratories in each department are shown in Table 40.

TABLE 40

WEEKLY ROOM HOUR CAPACITY OF EXISTING CLASS LABORATORIES IN EACH DEPARTMENT

(1)	(2)	(3)	(4)
Department	Number of Rooms (R)	Assumed Average Room Utilization Rate (AvRUR)	Weekly Room Hour Capacity (WRH_c) (4)=(2)x(3)
Biology	6	20	120
Zoology	2	20	40
Chemistry	6	20	120
Geology	2	25	50
Physics	4	24	96

4. Determine the total number of Weekly Student Hours (WSH) for each department which can be accommodated in existing class laboratories.

   The Weekly Student Hour capacities (WSH_c) of the class laboratories in each department are indicated in Table 41.

TABLE 41

WEEKLY STUDENT HOUR CAPACITY OF EXISTING CLASS LABORATORIES IN EACH DEPARTMENT

(1)	(2)	(3)	(4)
Department	Total Stations (N)	Assumed Average Station Utilization Rate (AvSUR)	Weekly Student Hour Capacity (WSH_c) (4)=(2)x(3)
Biology	140	16	2,240
Zoology	60	16	960
Chemistry	140	15	2,100
Geology	60	16	960
Physics	100	18	1,800

5. An alternate method for determining the total number of Weekly Student Hours which can be accommodated in existing class laboratory space employs the ratio of Assignable Square Feet to Weekly Student Hours (ASF/WSH).

   The Weekly Student Hour capacities (WSH_c) of the class laboratories in each department, based upon this alternate method, are indicated in Table 42.

TABLE 42

WEEKLY STUDENT HOUR CAPACITY OF EXISTING CLASS LABORATORIES IN EACH DEPARTMENT BY ALTERNATE METHOD

(1)	(2)	(3)	(4)
Department	Total Assignable Square Feet* (ASF)	Assignable Square Feet per Weekly Student Hour** (ASF/WSH)	Weekly Student Hour Capacity (WSH_c) (4)=(2)÷(3)
Biology	6,720	$3.0 = 48 \div (20 \times 0.80)$	2,240
Zoology	2,880	$3.0 = 48 \div (20 \times 0.80)$	960
Chemistry	9,120	$4.0 = 60 \div (20 \times 0.75)$	2,280
Geology	2,880	$3.0 = 48 \div (25 \times 0.64)$	960
Physics	7,200	$4.0 = 72 \div (24 \times 0.75)$	1,800

*Includes class laboratory service space.
**ASF/WSH = [Av(ASF/N)] ÷ [(AvRUR) x (AvSOR)]

The WSH_c in Steps 4 and 5 agree in all cases except for chemistry. This exception occurs because the assumed ASF/N for chemistry is 60, but the actual ASF/N is 65+.

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for class laboratories of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the facilities data in Step 1.

Section 3.2.2

General Method A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

For each department

- Total number of class laboratories (R)
- Total number of Stations (N)
- Total Assignable Square Feet (ASF), including class laboratory service facilities

PROGRAM DATA REQUIRED

For each department

- Projected total class laboratory Weekly Room Hours (WRH)
- Projected total class laboratory Weekly Student Hours (WSH)

FACILITIES DATA REQUIRED

None

UTILIZATION ASSUMPTIONS REQUIRED

For each department

- Average Room Utilization Rate (AvRUR)
- Average Station Occupancy Ratio (AvSOR)
- Average number of Assignable Square Feet per Station [Av(ASF/N)], including laboratory service facilities

PROCEDURE

1. Obtain the curricular program data for each department.

   - Total projected class laboratory Weekly Room Hours (WRH)
   - Total projected class laboratory Weekly Student Hours (WSH)

   These numbers may be available either from the detailed program planning procedures discussed in Manual Six or from other estimates.

   For example, estimates of Weekly Student Hours can be based on an assumed average number of class laboratory Weekly Student Hours per FTE Student. If it is assumed that each FTE Student will average four scheduled hours per week in class laboratories, then for a projected student body of 2,400 students there will be 9,600 Weekly Student Hours of class laboratory instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE Students}) \times (\text{WSH per FTE Student}) \\ &= (2{,}400) \times (4) \\ &= 9{,}600 \text{ Weekly Student Hours} \end{aligned}$$

   If it is further assumed that the department of biology accounts for 30 percent of the total Weekly Student Hours, then there will be 2,880 Weekly Student Hours of instruction in biology.

If it is further assumed that the average laboratory Section Size (SS) in biology will be 18 students, then there will be 160 Weekly Room Hours (WRH).

$$\text{Biology WRH} = \frac{\text{(WSH)}}{\text{(Average Section Size)}}$$

$$= \frac{2{,}880}{18}$$

$$= 160 \text{ Weekly Room Hours}$$

2. Establish average utilization rates for each department as a matter of institutional policy.

   ►Average Room Utilization Rate (AvRUR)
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including laboratory service facilities

   For a more complete discussion of the range of utilization rates and Assignable Square Feet per Station see Section 3.4. of this manual.

3. Determine the required number of rooms for each department.

   This is the quotient obtained by dividing the total projected Weekly Room Hours (WRH) by the assumed Average Room Utilization Rate (AvRUR).

4. Determine the required number of Stations (N) for each department.

   This is the quotient obtained by dividing the total projected Weekly Student Hours (WSH) by the assumed Average Station Utilization Rate (AvSUR).

5. Determine the number of Assignable Square Feet (ASF) of class laboratory space required for each department, including the related service facilities.

   This is the product of the number of Stations (N) and the assumed Average Number of Assignable Square Feet per Station [Av(ASF/N)].

COMMENTS ON THE PROCEDURE

See the Introductory Comments concerning General Method A for the limitations of this procedure for projecting class laboratory requirements (Section 3.2.).

Section 3.2.2

General Method A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED For each department

- ►Total number of class laboratories (R)
- ►Total number of Stations (N)
- ►Total Assignable Square Feet (ASF), including class laboratory service facilities

PROCEDURE 1. Obtain the curricular program data for each department.

- ►Total projected class laboratory Weekly Room Hours (WRH)
- ►Total projected class laboratory Weekly Student Hours (WSH)

These data are tabulated in Table 43.

TABLE 43

PROJECTED WEEKLY ROOM HOURS AND WEEKLY STUDENT HOURS IN CLASS LABORATORIES BY DEPARTMENT

(1) Department	(2) Weekly Room Hours (WRH)	(3) Weekly Student Hours (WSH)
Biology	160	2,880
Zoology	40	960
Chemistry	144	3,000
Geology	48	960
Physics	88	1,800

2. Establish average utilization rates for each department as a matter of institutional policy.

   ►Average Room Utilization Rate (AvRUR)
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including related service facilities

   These average utilization rates are shown in Table 44.

TABLE 44

ASSUMED AVERAGE CLASS LABORATORY UTILIZATION RATES* FOR EACH DEPARTMENT

(1)	(2)	(3)	(4)	(5)
Department	Average Room Utilization Rate (AvRUR)	Average Station Occupancy Ratio (AvSOR)	Average Station Utilization Rate (AvSUR) (4)=(2)x(3)	Average Assignable Square Feet per Station** [Av(ASF/N)]
Biology	20	0.80	16	48
Zoology	20	0.80	16	48
Chemistry	20	0.75	15	60
Geology	25	0.64	16	48
Physics	24	0.75	18	72

*These utilization rates are illustrative only and are not recommended as standards.
**Including class laboratory service areas.

3. Determine the required number of rooms for each department.

   An example of this determination is shown in Table 45.

TABLE 45

REQUIRED NUMBER OF CLASS LABORATORIES FOR EACH DEPARTMENT

(1)	(2)	(3)	(4)
Department	Weekly Room Hours (WRH)	Assumed Average Room Utilization Rate (AvRUR)	Required Number of Rooms (R) (4)=(2)÷(3)
Biology	160	20	8.00 = 8
Zoology	40	20	2.00 = 2
Chemistry	144	20	7.20 = 8*
Geology	48	25	1.92 = 2*
Physics	88	24	3.25 = 4*

*Because fractional numbers of rooms cannot be built, any calculated result which is not a whole number is rounded to the next higher whole number.

4. Determine the required number of Stations for each department.

   An example of this determination is shown in Table 46.

TABLE 46

REQUIRED NUMBER OF CLASS LABORATORY STATIONS FOR EACH DEPARTMENT

(1) Department	(2) Weekly Student Hours (WSH)	(3) Assumed Average Station Utilization Rate (AvSUR)	(4) Required Number of Stations [N=(WSH)/(AvSUR)] (4)=(2)÷(3)
Biology	2,880	16	180
Zoology	960	16	60
Chemistry	3,000	15	200
Geology	960	16	60
Physics	1,800	18	100

5. Determine the number of Assignable Square Feet (ASF) of class laboratory space required for each department, including the related service facilities.

   An example of this determination is shown in Table 47.

TABLE 47

REQUIRED TOTAL ASSIGNABLE SQUARE FEET OF CLASS LABORATORY SPACE FOR EACH DEPARTMENT

(1) Department	(2) Total Number of Stations (N)	(3) Assignable Square Feet per Station* (ASF/N)	(4) Total Assignable Square Feet (ASF) (4)=(2)x(3)
Biology	180	48	8,640
Zoology	60	48	2,880
Chemistry	200	60	12,000
Geology	60	48	2,880
Physics	100	72	7,200

*These assumed Assignable Square Feet per Station are illustrative only and are not recommended as standards.

Section 3.2.3

General Method A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

For each department

- ►Additional number of class laboratories (R)
- ►Additional number of Stations (N)
- ►Additional Assignable Square Feet (ASF), including class laboratory service facilities

PROGRAM DATA REQUIRED

For each department

- ►Projected total class laboratory Weekly Room Hours (WRH)
- ►Projected total class laboratory Weekly Student Hours (WSH)

FACILITIES DATA REQUIRED

For each department

- ►Weekly Room Hour capacity (WRH_c) of existing class laboratories
- ►Weekly Student Hour capacity (WSH_c) of existing class laboratories

UTILIZATION ASSUMPTIONS REQUIRED

For each department

- ►Average Room Utilization Rate (AvRUR)
- ►Average Station Occupancy Ratio (AvSOR)
- ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including class laboratory service areas

PROCEDURE

1. Obtain the curricular program data for each department.

   - ►Total projected class laboratory Weekly Room Hours (WRH)
   - ►Total projected class laboratory Weekly Student Hours (WSH)

   These numbers may be available either from the detailed program planning procedures discussed in Manual Six or from other estimates.

   For example, estimates of Weekly Student Hours can be based on an assumed average number of class laboratory Weekly Student Hours per FTE Student. If it is assumed that each FTE Student will average four scheduled hours per week in class laboratories, then for a projected student body of 2,400 students there will be 9,600 Weekly Student Hours of class laboratory instruction.

$$
\begin{aligned}
\text{WSH} &= (\text{FTE Students}) \times (\text{WSH per FTE Student}) \\
&= (2{,}400) \times (4) \\
&= 9{,}600 \text{ Weekly Student Hours}
\end{aligned}
$$

If it is further assumed that the department of biology accounts for 30 percent of the total Weekly Student Hours, then there will be 2,880 Weekly Student Hour of instruction in biology.

If it is further assumed that the average laboratory Section Size in biology will be 18 students, then there will be 160 Weekly Room Hours (WRH).

$$\text{Biology WRH} = \frac{\text{(WSH)}}{\text{(Average Section Size)}} = \frac{2{,}880}{18} = 160 \text{ Weekly Room Hours}$$

2. Establish average utilization rates for each department as a matter of institutional policy.

   ►Average Room Utilization Rate (AvRUR)
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including related service areas
   ►Average Station Occupancy Ratio (AvSOR)
   ►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including related service areas

   For a more complete discussion of the range of utilization rates and Assignable Square Feet per Station see Section 3.4. of this manual.

3. Determine the additional number of rooms (R) required for each department.

   This is the difference between the projected departmental Weekly Room Hours (WRH) and the Weekly Room Hour capacity (WRH_c) of existing class laboratories divided by the assumed Average Room Utilization Rate (AvRUR).

$$\text{Additional Class Laboratories} = \frac{\text{(Projected Departmental WRH)} - \text{(Existing Departmental } WRH_c\text{)}}{\text{(AvRUR)}}$$

   A method of calculating WRH_c for each department is discussed in Section 3.2.1.

4. Determine the additional number of Stations (N) required for each department.

   This is the difference between the total projected Weekly Student Hours (WSH) and the Weekly Student Hour capacity (WSH_c) of existing class laboratory Stations (N) divided by the assumed Average Station Utilization Rate (AvSUR).

$$\text{Additional Stations} = \frac{\text{(Projected Departmental WSH)} - \text{(Existing Departmental } WSH_c\text{)}}{\text{(AvSUR)}}$$

   A method of calculating WSH_c for each department is discussed in Section 3.2.1.

5. Determine the additional number of Assignable Square Feet (ASF) of class laboratory space required for each department.

   This is the product of the number of additional Stations (N) and the assumed Average Number of Assignable Square Feet per Station [Av(ASF/N)], including class laboratory service space.

   $$\text{Additional Department ASF} = (\text{Additional Departmental N}) \times [\text{Av(ASF/N)}]$$

COMMENTS ON THE PROCEDURE

See the Introductory Comments on General Method A for the limitations of this procedure in projecting additional class laboratory requirements.

Note that this procedure makes no assumption about the quality of the existing class laboratory space. Class laboratory facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Step 1 of the Procedure in Section 3.2.1.

Section 3.2.3

General Method A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED For each department

- ►Additional number of class laboratories (R)
- ►Additional number of Stations (N)
- ►Additional Assignable Square Feet (ASF), including class laboratory service facilities

PROCEDURE 1. Obtain the curricular program data for each department.

- ►Total projected class laboratory Weekly Room Hours (WRH)
- ►Total projected class laboratory Weekly Student Hours (WSH)

These data are shown in Table 48.

TABLE 48

PROJECTED WEEKLY ROOM HOURS AND WEEKLY STUDENT HOURS IN CLASS LABORATORIES BY DEPARTMENT

(1)	(2)	(3)
Department	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
Biology	160	2,880
Zoology	40	960
Chemistry	144	3,000
Geology	48	960
Physics	88	1,800

2. Establish average utilization rates for each department as a matter of institutional policy.

►Average Room Utilization Rate (AvRUR)
►Average Station Occupancy Ratio (AvSOR)
►Average Number of Assignable Square Feet per Station [Av(ASF/N)], including related service facilities

These average utilization rates are shown in Table 49.

TABLE 49

ASSUMED AVERAGE CLASS LABORATORY UTILIZATION RATES* FOR EACH DEPARTMENT

(1)	(2)	(3)	(4)	(5)
Department	Average Room Utilization Rate (AvRUR)	Average Station Occupancy Ratio (AvSOR)	Average Station Utilization Rate (AvSUR) (4)=(2)x(3)	Average Assignable Square Feet per Station** Av(ASF/N)
Biology	20	0.80	16	48
Zoology	20	0.80	16	48
Chemistry	20	0.75	15	60
Geology	25	0.64	16	48
Physics	24	0.75	18	72

*These utilization rates are illustrative only and are not recommended as standards.
**Including class laboratory service areas.

3. Determine the additional number of rooms (R) required for each department.

An example of this determination is shown in Table 50.

TABLE 50

REQUIRED ADDITIONAL CLASS LABORATORIES FOR EACH DEPARTMENT

(1)	(2)	(3)*	(4)	(5)	(6)
Department	Projected Weekly Room Hours (WRH)	Existing Weekly Room Hour Capacity (WRH_c)	Additional Weekly Room Hour Capacity Required (WRH_c) (4)=(2)−(3)	Assumed Average Room Utilization Rate (AvRUR)	Additional Class Laboratories Required (R) (6)=(4)÷(5)
Biology	160	120	40	20	2.00 = 2
Zoology	40	40	0	20	0.00 = 0
Chemistry	144	120	24	20	1.20 = 2**
Geology	48	50	0	25	0.00 = 0
Physics	88	96	0	24	0.00 = 0

*The existing WRH_c in column 3 were determined in the Example in Section 3.2.1.
**Because fractional numbers of rooms cannot be built, any calculated result which is not a whole number is rounded to the next higher whole number.

4. Determine the additional number of Stations (N) required for each department.

   An example of this determination is shown in Table 51.

TABLE 51

REQUIRED ADDITIONAL CLASS LABORATORY STATIONS FOR EACH DEPARTMENT

(1)	(2)	(3)*	(4)	(5)	(6)
Department	Projected Weekly Student Hours (WSH)	Existing Weekly Student Hour Capacity (WSH$_c$)	Additional Weekly Student Hour Capacity Required (WSH$_c$)	Assumed Average Station Utilization Rate (AvSUR)	Additional Class Laboratory Stations Required (N)
			(4)=(2)−(3)		(6)=(4)÷(5)
Biology	2,880	2,240	640	16	40
Zoology	960	960	0	16	0
Chemistry	3,000	2,100	900	15	60
Geology	960	960	0	16	0
Physics	1,800	1,800	0	18	0

*The existing WSH$_c$ in column 3 were determined in the Example in Section 3.2.1.

5. Determine the additional number of Assignable Square Feet of class laboratory space required for each department.

   An example of this determination is shown in Table 52.

TABLE 52

REQUIRED ADDITIONAL SQUARE FEET OF CLASS LABORATORY SPACE FOR EACH DEPARTMENT

(1)	(2)	(3)	(4)
Department	Additional Stations (N)	Assumed Average Assignable Square Feet per Station [Av(ASF/N)]	Additional Assignable Square Feet (ASF)
			(4)=(2)x(3)
Biology	40	48	1,920
Zoology	0	48	0
Chemistry	60	60	3,600*
Geology	0	48	0
Physics	0	72	0

*Note that under the procedure recommended here the additional class laboratory space for chemistry is 3,600 ASF. If an alternate method had been used, the additional need would have been calculated to be 2,880 ASF. This alternate method would have multiplied the total projected chemistry Stations (200) by the assumed Average Square Feet per Station (60) yielding a projected Assignable Square Feet requirement of 12,000 ASF for chemistry. Because 9,120 ASF already exist for chemistry, only 2,880 additional ASF (12,000 − 9,120) theoretically would be required. However, the existing laboratories exceed the Average Assignable Square Feet per Station assumed for chemistry. This existing "excess" cannot be used to satisfy the space required by the projected two additional class laboratories with a total of 60 Stations. In practice, a decision must be made to determine whether or not existing excesses above assumed criteria can be used effectively to meet projected additional requirements.

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for class laboratories of such poor quality that they should be abandoned. Where such an adjustment is necessary, such class laboratories should be excluded from the existing facilities assumed in Step 1 of the Example in Section 3.2.1.

Section 3.3.

Class Laboratory

GENERAL METHOD B

INTRODUCTORY COMMENTS

The general planning method described on succeeding pages can be very useful in certain limited applications. It can also be applied inappropriately and therefore may be very dangerous in the hands of the novice. This method depends entirely on the validity of a single average number and yields only one rough-estimate answer. When the validity of the average can be demonstrated, the result has some utility as a rough estimate. Ultimately, however, the evaluation and projection of class laboratory requirements should take the form of the analysis outlined in the preceding Detailed Method section.

Method B uses Assignable Square Feet per FTE Student as its only criterion. Because this criterion is based upon total institutional enrollments, it is not possible under Method B to evaluate or project class laboratory space on a departmental basis. For the evaluation of existing space, Method B yields an estimate of the number of FTE Students who can be accommodated in the existing class laboratory space; for projecting class laboratory space for a new institution it provides only an estimate of the total Assignable Square Feet required; for projections of class laboratory space for an existing institution it provides only the total additional Assignable Square Feet required.

Section 3.3.1

General Method B

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DISCUSSION

DATA TO BE DETERMINED

►Total number of FTE Students for which the existing class laboratories can accommodate the class laboratory instruction

PROGRAM DATA REQUIRED

None

FACILITIES DATA REQUIRED

►Total* Assignable Square Feet (ASF) in existing class laboratories

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)] required.

PROCEDURE

1. Obtain the total* Assignable Square Feet (ASF) in class laboratories.
2. Establish on the basis of institutional practice the required average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].
3. Determine the total number of FTE Students for which the existing class laboratories can accommodate the class laboratory instruction.

   This is the quotient obtained by dividing the existing total Assignable Square Feet of class laboratory space by the assumed average number of total* Assignable Square Feet required per FTE Student.

COMMENTS ON THE PROCEDURE

See the Introductory Comments concerning General Method B for the limitations of this procedure in evaluating the capacity of existing class laboratory facilities.

Note that this procedure makes no assumption about the quality of existing class laboratory facilities.

---

*"Total" implies the inclusion of class laboratory service facilities Assignable Square Feet.

Section 3.3.1

General Method B

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

EXAMPLE

DATA TO BE DETERMINED

►Total number of FTE Students for which the existing class laboratories can accommodate the class laboratory instruction.

PROCEDURE

1. Obtain the total* Assignable Square Feet (ASF) in existing class laboratories.

   ►Total class laboratory ASF = 28,800 Assignable Square Feet

2. Establish on the basis of institutional practice the required average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].**

   ►Average Assignable Square Feet per FTE Student = 16

3. Determine the total number of FTE Students for which the existing class laboratory space can accommodate the class laboratory instruction.

$$\begin{aligned} \text{FTE Sn} &= (\text{ASF}) \div [\text{Av}(\text{ASF}/\text{FTE Sn})] \\ &= (28{,}800) \div (16) \\ &= 1{,}800 \text{ FTE Students} \end{aligned}$$

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for class laboratories of such poor quality that they should be abandoned. Where such an adjustment is necessary, such class laboratories should be excluded from the existing facilities assumed in Step 1.

---

*"Total" implies the inclusion of class laboratory service facilities Assignable Square Feet.

**The Average Number of Assignable Square Feet per FTE Student used in Step 2 is illustrative only and is not recommended as a standard.

Section 3.3.2

General Method B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Total* Assignable Square Feet (ASF) of class laboratory space required

PROGRAM DATA REQUIRED

►Projected total FTE Students (FTE Sn)

FACILITIES DATA REQUIRED

None

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)] required.

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).
2. Establish, as an institutional goal or on the basis of external criteria, the required average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].
3. Determine the total* Assignable Square Feet (ASF) of class laboratory space required.

   This is the product of the projected total FTE Students and the assumed average number of total* class laboratory Assignable Square Feet per FTE Student.

COMMENTS ON THE PROCEDURE

See the Introductory Comments concerning General Method B for the limitations of this procedure in projecting class laboratory Assignable Square Feet.

---

*"Total" implies the inclusion of class laboratory service facilities Assignable Square Feet.

Section 3.3.2

General Method B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

►Total* Assignable Square Feet (ASF) of class laboratory space required

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).

FTE Sn = 2,400 FTE Students

2. Establish, as an institutional goal or on the basis of external criteria, the required average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)].

Average class laboratory ASF/FTE Sn = 14 Assignable Square Feet per FTE Student**

3. Determine the total* Assignable Square Feet (ASF) of class laboratory space required.

Class laboratory ASF = (FTE Sn) x [Av(ASF/FTE Sn)]
= (2,400) x (14)
= 33,600 Assignable Square Feet

---

*"Total" implies the inclusion of class laboratory service facilities Assignable Square Feet.
**The Average Number of Assignable Square Feet per FTE Student used in Step 2 is illustrative only and is not recommended as a standard.

Section 3.3.3

General Method B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Additional total* Assignable Square Feet (ASF) of class laboratory space required

PROGRAM DATA REQUIRED

►Projected Total FTE Students (FTE Sn)

FACILITIES DATA REQUIRED

►Total* Assignable Square Feet (ASF) in existing class laboratories

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)] required

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn).
2. Establish, as an institutional goal or on the basis of external criteria, the average number of total* class laboratory Assignable Square Feet required per FTE Student [Av(ASF/FTE Sn)].
3. Determine the total* Assignable Square Feet of class laboratory space required (ASF).

   This is the product of the projected total FTE Students and the assumed average number of total* class laboratory Assignable Square Feet per FTE Student.
4. Determine the number of additional total* class laboratory Assignable Square Feet (ASF) required between the present and the projected year.

   This is the difference between the existing and projected numbers of total* class laboratory Assignable Square Feet.

COMMENTS ON THE PROCEDURE

See the Introductory Comments concerning General Method B for the limitations of this procedure in projecting additional class laboratory Assignable Square Feet.

Note that this procedure makes no assumptions about the quality of existing class laboratory facilities.

---

*"Total" implies the inclusion of class laboratory service facilities Assignable Square Feet.

Section 3.3.3

General Method B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

►Additional total* Assignable Square Feet (ASF) of class laboratory space required

PROCEDURE

1. Obtain the projected total number of FTE Students (FTE Sn):

   FTE Sn = 2,400 FTE Students

2. Establish, as an institutional goal or on the basis of external criteria, the average number of total* class laboratory Assignable Square Feet per FTE Student [Av(ASF/FTE Sn)] required.**

   Average class laboratory ASF/FTE Sn = 14 Assignable Square Feet per FTE Student

3. Determine the total* Assignable Square Feet (ASF) of class laboratory space required.

   Total* Class Laboratory ASF = (FTE Sn) x [Av(ASF/FTE Sn)]
   = (2,400) x (14)
   = 33,600 Assignable Square Feet

4. Determine the number of additional total* class laboratory Assignable Square Feet (ASF) required between the present and the projected year.

   Additional class laboratory ASF = (Projected ASF) − (Existing ASF)
   = (33,600) − (28,800)
   = 4,800 Assignable Square Feet

COMMENTS ON THE PROCEDURE

Note that this example makes no allowance for class laboratory Assignable Square Feet of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the existing Assignable Square Feet data in Step 4.

---

*"Total" implies the inclusion of class laboratory service facilities Assignable Square Feet.

**The Average Number of Assignable Square Feet per FTE Student used in Step 2 is illustrative only and is not recommended as a standard.

Section 3.4.

SPECIAL CLASS LABORATORY AND INDIVIDUAL STUDY LABORATORY

ROOM TYPES INCLUDED

1. Special Class Laboratories

   In its physical characteristics a special class laboratory may resemble a class laboratory. It is called "special" because a large portion of its use is scheduled on an informal ("drop in" or "first come first served") basis. Typically (but not necessarily nor exclusively) included are group tutorial rooms, language laboratories, group music practice rooms, group studios, etc.

2. Individual Study Laboratories

   An individual study laboratory is a room equipped and designed for individual experimentation, observation, or practice in a particular field of study. Individual Stations may be grouped together in a room (as in an auto-tutorial laboratory) or may each represent a room (as in a music practice room).

DISCUSSION

In the evaluation and projection of special class laboratory and individual study laboratory facilities, it is helpful to understand the distinction between these two types of laboratories as well as the differences between each of them and a class laboratory. The differences are relative rather than absolute.

In both instances, a class laboratory and a special class laboratory involve organized instructional groups called classes (generally referred to as Sections in this manual). The difference between them is the degree of nonscheduled or informally scheduled use. The informally scheduled use for a class laboratory typically ranges from none to a fairly large percentage, while for a special class laboratory it ranges from a fairly high percentage to one hundred percent. Thus class laboratories are primarily formally scheduled instructional facilities, while special class laboratories are primarily informally scheduled instructional facilities.

A class laboratory differs from an individual study laboratory in the way in which students are organized for instructional purposes and in the manner of scheduling the facility. A class laboratory typically involves organized instructional groups called classes. An individual study laboratory typically involves individuals working at their own pace, with or without instructional assistance. Further, a class laboratory is typically scheduled by a central institutional agency (such as the registrar's office) while individual study laboratories generally are either unscheduled or scheduled by the organizational unit for which they provide instructional support (such as a department of music).

An individual study laboratory differs from a special class laboratory primarily in the way students are organized for instructional purposes—that is, individuals versus groups. Both typically are informally scheduled.

An understanding of these differences between the three instructional laboratory types s fundamental to the development of procedures for evaluating and projecting the acility requirements for special class laboratories and individual study laboratories. Because these latter two types of laboratories are typically unscheduled or informally scheduled, the two measures of instructional program load, Weekly Room Hours and Weekly Student Hours, used in evaluating and projecting class laboratory requirements are not likely to be available. Indeed, Weekly Room Hours and Weekly Student Hours have been defined to include only formally scheduled hours of instruction. Therefore the use of WRH and WSH for determining special class laboratory and individual study laboratory requirements is inappropriate because the amount of informal use is usually greater in such facilities than is any occasional formally scheduled use.

Because the utilization criteria used in evaluating and projecting class laboratory techniques were based on assumptions of scheduled use only, those criteria also are inappropriate for special class laboratories and individual study laboratories.

In order to evaluate the capacity of, or project the need for, special class laboratories and individual study laboratories, it is necessary to find "proxies" for the measures of curricular program load and for the utilization criteria. Somewhat arbitrarily, we shall call the curricula program data indices

- ►Imputed Weekly Room Hours (IWRH)
- ►Imputed Weekly Student Hours (IWSH)

and the utilization criteria

- ►Imputed Room Utilization Rate (IRUR)
- ►Imputed Station Occupancy Ratio (ISOR)
- ►Imputed Station Utilization Rate (ISUR)

If these two instructional program elements and three utilization criteria can be defined and measured, they can be used as "proxies" for their corresponding elements in the Procedure outlined for class laboratories in Sections 3.1.1, 3.1.2, and 3.1.3.

Imputed Weekly Room Hours (IWRH) are the sum of any scheduled WRH and the number of hours of room use informally scheduled. These informally scheduled hours may be a matter of record or may be estimated. One means of estimating IWRH requires an assumed Imputed Station Occupancy Ratio (ISOR) and Imputed Weekly Student Hours (IWSH). If the number of IWSH is known (or can be estimated) and an ISOR is assumed, then the number of IWRH is the quotient of the IWSH by the product of the ISOR and number of Stations (N). This latter product (N x ISOR) is analagous to an Average Section Size (AvSS) and can be used as an Imputed Average Section Size (IAvSS).

$$\text{IWRH} = (\text{IWSH}) \div [(\text{N}) \times (\text{ISOR})]$$

Imputed Weekly Student Hours (IWSH) are the sum of any scheduled WSH and the number of informally scheduled hours students are occupying the Stations in the room. These informally scheduled hours may be a matter of record or may be estimated. In an existing institution, the Imputed Weekly Student Hours may result from observed historical relationships between number of course registrations and actual hours of use of special class laboratories or individual study laboratories. For a new institution, either such relationship must be estimated or the experience of another institution with a similar program may be used. In whatever manner this ratio is determined, the average number of hours per week each course registrant uses the laboratory, multiplied by the projected number of course registrants, provides an estimate of the Imputed Weekly Student Hours.

$$\begin{aligned}\text{IWSH} = {} & (\text{Projected Number of Course Registrants}) \times \\ & (\text{Average IWSH per Course Registrant})\end{aligned}$$

If it is possible to obtain a measure of the IWRH, the IWSH may also be computed the product of the number of Stations (N) times the Imputed Station Occupancy Rate (ISOR) times the Imputed Weekly Room Hours (IWRH).

$$\text{IWSH} = (\text{N}) \times (\text{ISOR}) \times (\text{IWRH})$$

Note that for single-Station individual study laboratories IWRH and IWSH are identical.

Imputed Room Utilization Rate (IRUR) is the number of hours per week a special class laboratory or an individual study laboratory is used both formally and informally.

Imputed Station Occupancy Ratio (ISOR) is the proportion of Stations used both formally and informally when a special class laboratory or an individual study laboratory is used.

Imputed Station Utilization Rate (ISUR) is the number of hours per week the Stations in a special class laboratory or an individual study laboratory are used both formally and informally. It is also the product of the Imputed Room Utilization Rate and the Imputed Station Occupancy Ratio.

$$\text{ISUR} = (\text{IRUR}) \times (\text{ISOR})$$

PROCEDURE

Discussions and examples for evaluating the capacity of, or projecting the need for, special class laboratories and individual study laboratories will not be developed in this Section because it is only necessary to substitute the imputed program data (IWRH and IWSH) and utilization assumptions (IRUR, ISOR, and ISUR) in the rocedure discussed and illustrated for class laboratories in Sections 3.1.1, 3.1.2, and 3.1.3.

In Section 3.1.1 make the following substitutions to evaluate the capacity of existing special class laboratories or individual study laboratories:

- ►IWRH for WRH
- ►IWSH for WSH
- ►IRUR for RUR
- ►ISOR for SOR
- ►ISUR for SUR
- ►IWRH_c for WRH_c
- ►IWSH_c for WSH_c

n Section 3.1.2 make the following substitutions to project the requirements for pecial class laboratories or individual study laboratories in a new institution:

- ►IWRH for WRH
- ►IWSH for WSH
- ►IAvSS for AvSS
- ►IRUR for RUR
- ►ISOR for SOR
- ►ISUR for SUR

Other Labs

In Section 3.1.3 make the following substitutions to project the requirements for additional special class laboratories or individual study laboratories in an existin institution:

- ►IWRH for WRH
- ►IWSH for WSH
- ►IAvSS for AvSS
- ►IRUR for RUR
- ►ISOR for SOR
- ►ISUR for SUR

Section 3.5.

CLASS LABORATORY UTILIZATION AND UNIT FLOOR AREA CRITERIA

ROOM TYPES INCLUDED

Class laboratory and class laboratory service
Special class laboratory and special class laboratory service
Individual study laboratory and individual study laboratory service

UTILIZATION CRITERIA

In the evaluation and the projection of class laboratory requirements two measures of utilization are used: a Room Utilization Rate and a Station Occupancy Ratio. It is important to recognize that these are not independent measures. Frequently an increase in the Room Utilization Rate occurs at the expense of the Station Occupancy Ratio. Consider, for example, a one-Section course of 30 students meeting in a class laboratory with 30 Stations. If one more student enrolls in that course and it is divided into two Sections of 15 and 16 students, then the Room Utilization Rate is doubled, but the Station Occupancy Ratio is cut nearly in half.

This manual cannot recommend utilization criteria for individual class laboratories, for such criteria can legitimately have a wide range. It is possible, however, to indicate some broad ranges within which average utilization rates may be expected to fall when the demand upon these facilities is sufficient to make the application of utilization criteria appropriate and valid.

In general, for class laboratories which primarily (or exclusively) serve lower division level courses in most departments, an Average Room Utilization Rate may range from 18 to 22 hours per week.

In general, a lower Average Room Utilization Rate is justified for class laboratories which primarily (or exclusively) serve upper division level courses. In addition, a lower Average Room Utilization Rate is recommended for those academic departments where the amount of nonscheduled use is large. Typical departments for which lower Average Room Utilization Rates might be considered appropriate include

> Architecture, Landscape Architecture, Planning, Fine Arts, Foreign Languages, Library Science, and similar departments.

Average Room Utilization Rates for class laboratories in these categories may range from 14 to 18 hours per week.

In general, a higher Average Room Utilization Rate is appropriate in those departments where little nonscheduled use occurs. Typical departments include

> Area Studies, Business and Management, Computer and Information Sciences, Mathematics, some Social Sciences (such as History, Philosophy, Economics, and Political Science), and similar departments.

Average Room Utilization Rates for class laboratories in this category may range from 22 to 26 hours per week.

In general, the Average Station Occupancy Ratio is most likely to reach maximum value for the class laboratory Stations which serve multi-Sectioned lower division courses, particularly at the freshman level. In most instances, the Average Station

Occupancy Ratio can be expected to decrease as the level of the course and the degree of specialization increase.

Average Station Occupancy Ratios for class laboratories serving lower division multi-Sectioned courses may range from 0.75 to 0.85.

Average Station Occupancy Ratios for class laboratories serving specialized upper division courses may range from 0.50 to 0.70.

UNIT FLOOR AREA CRITERIA

Laboratory furniture varies considerably in its design and dimensions. Moreover, many courses require laboratory equipment in the class laboratory beyond the actual bench space or work surface provided each student. An example is a fume hood in a chemistry class laboratory. In planning new facilities or in the replacement of laboratory equipment in existing facilities, it is important to first choose the kind and number of each piece of laboratory equipment required and then to make dimensioned layouts of actual equipment arrangements in the class laboratories.

As a general planning guide, Tables 53 and 54 present ranges of class laboratory unit floor area criteria It should be noted that different room shapes, equipment configurations, and the amounts of circulation space within the class laboratory affect these unit area allowances.

In those instances where course level affects the size of the unit floor area criteria, values are shown for both lower and upper division courses. Graduate-level courses frequently require more nonclass laboratory facilities than class laboratories. Where graduate-level courses do require class laboratory space, the upper bounds of the range of values shown in Table 53 for upper-division level courses are generally appropriate. For example, Table 53 shows a range of 40 to 60 Assignable Square Feet per Station (including service space) for histology (HEGIS Discipline Code 0413). The lower bounds of this range, say 40 to 50 Assignable Square Feet per Station, are more appropriate to class laboratories for upper-division level courses. The upper bounds of this range, say 50 to 60 Assignable Square Feet per Station, are more appropriate to class laboratories for graduate-level courses.

In certain instances, the range of Assignable Square Feet per Station within a course level must be specified for groups of courses more detailed than the HEGIS Discipline Specialities permits. An example of this occurs in the case of animal science (HEGIS Discipline Code 0104). In this instance, chemical type laboratories require 30 to 40 Assignable Square Feet per Station (excluding service space), while class laboratories involving animal practices range from 40 to 80 Assignable Square Feet per Station with the actual value depending on the size of the animals involved.

TABLE 53
CLASS LABORATORY ASSIGNABLE SQUARE FEET PER STATION CRITERIA—ACADEMIC CURRICULA

(1)	(2)	(3)	(4)	(5)
			Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Course Levels	Excluding Services	Including Services
0100	AGRICULTURE AND NATURAL RESOURCES			
0101	General	Lower	30-40	50-60
0102	Agronomy, Crops	Lower	30-40	50-60
		Upper	40-50	60-80
0103	Soil Science	Lower	30-40	50-60
		Upper	40-50	60-80
0104	Animal Science			
	Chemical Analyses	Lower	30-40	60-80
	Animal Practices	Lower	40-80	100-160
		Upper	50-60	100-160
0105	Dairy Science			
	Chemical Analyses	Lower	30-40	60-80
	Animal Practices	Lower	40-80	100-160
		Upper	50-60	100-160
0106	Poultry Science	Lower	30-40	50-60
		Upper	40-50	60-80
0107	Fish, Game, Wildlife	Lower	30-40	50-60
		Upper	40-50	60-80
0108	Horticulture	Lower	30-40	50-60
		Upper	40-50	60-80
0109	Ornamental Horticulture	Lower	30-40	50-60
		Upper	40-50	60-70
0110	Agricultural and Farm Management	All	30-40	50-60
0111	Agricultural Economics	All	20-30	25-35
0112	Agricultural Business	All	20-30	25-40
0113	Food Science and Technology	Lower	30-50	50-65
		Upper	50-60	60-80
0114	Forestry	Lower	30-40	50-60
		Upper	40-50	60-70
0115	Natural Resource Management	All	30-40	40-50
0116	Agriculture and Forest Technologies	All	35-70	50-80
0117	Range Management	All	30-50	40-60
0200	ARCHITECTURE AND ENVIRONMENTAL DESIGN			
0201	General	Lower	40-50	50-60
0202	Architecture	Lower	40-50	50-60
		Upper	50-60	60-70
0203	Interior Design	All	40-50	50-70
0204	Landscape Architecture	All	50-60	60-70
0205	Urban Architecture	All	40-60	50-70
0206	City, Community, and Regional Planning	All	30-60	40-70
0300	AREA STUDIES	All	25-30	30-35
0400	BIOLOGICAL SCIENCES			
0401	Biology, General	Lower	30-40	45-55
0402	Botany, General	Lower	30-40	45-55
		Upper	40-60	50-70
0403	Bacteriology	Lower	30-40	50-70
		Upper	40-60	60-90
0404	Plant Pathology	Lower	30-40	45-55
		Upper	40-60	50-70
0405	Plant Pharmacology	Lower	30-40	45-55
		Upper	40-60	50-70
0406	Plant Physiology	Lower	30-40	45-55
		Upper	40-60	50-70
0407	Zoology, General	Lower	30-40	50-70
		Upper	40-60	60-80
0408	Pathology	Lower	30-40	50-70
		Upper	40-60	60-80
0409	Pharmacology	Lower	30-40	40-50
		Upper	40-60	60-80
0410	Physiology	Lower	30-40	50-70
		Upper	40-60	70-90

TABLE 53 (continued)

(1)	(2)	(3)	(4)	(5)
			Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Course Levels	Excluding Services	Including Services
0411	Microbiology	Lower	30-40	50-70
		Upper	40-60	60-80
0412	Anatomy			
	Developmental	Lower	30-40	45-55
	Gross	Lower	50-60	60-80
		Upper	40-60	60-80
0413	Histology	Lower	30-40	45-55
		Upper	40-60	60-80
0414	Biochemistry	Lower	40-50	55-65
		Upper	50-60	60-80
0415	Biophysics	Lower	40-50	55-65
		Upper	50-60	60-80
0416	Molecular Biology	Lower	30-40	50-70
		Upper	40-60	60-80
0417	Cell Biology	Lower	30-40	50-70
		Upper	40-60	60-80
0418	Marine Biology	Lower	30-50	60-100
		Upper	40-70	70-150
0419	Biometrics and Biostatistics	All	25-30	30-35
0420	Ecology	Lower	30-40	45-55
		Upper	40-60	60-80
0421	Entomology	Lower	30-40	45-55
		Upper	40-60	60-80
0422	Genetics	Lower	30-40	45-55
		Upper	40-60	60-80
0423	Radiobiology	Lower	30-40	45-55
		Upper	40-60	60-80
0424	Nutrition	Lower	40-50	55-65
		Upper	50-60	60-80
0425	Neurosciences	Lower	30-40	50-70
		Upper	40-60	70-90
0426	Toxicology	Lower	30-40	45-55
		Upper	40-60	50-70
0427	Embryology	Lower	30-40	50-70
		Upper	40-60	60-80
0500	BUSINESS AND MANAGEMENT	All	20-30	25-40
0600	COMMUNICATIONS			
0601	General	All	25-40	30-50
0602	Journalism	All	25-40	30-50
0603	Radio/Television	All	25-40	50-100
0604	Advertising	All	25-40	30-50
0605	Communication Media	All	25-40	30-50
0700	COMPUTER AND INFORMATION SCIENCES	All	25-50	35-85
0800	EDUCATION			
0822	Educational Psychology	All	25-50	30-70
0824	Educational Statistics and Research	All	25-35	30-40
0836	Driver and Safety Education	All	25-40	30-50
0839	Industrial Arts, Vocational and Technical Evaluation	All	30-50	60-80
08—	All other EDUCATION except Physical Education (0835). For Physical Education see Manual Five.	All	25-35	30-40
0900	ENGINEERING			
0901	General	All	40-70	90-120
0902	Aerospace, Aeronautical, and Astronautical	All	100-150	130-180
0903	Agricultural Engineering			
	Electrical	All	40-50	55-65
	Soil and Water	All	50-60	70-80
	Structural	All	80-100	100-120
	Metal and Shop	All	100-120	120-140
	Machinery and Equipment	All	100-150	130-180

TABLE 53 (continued)

(1)	(2)	(3)	(4)	(5)
			Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Course Levels	Excluding Services	Including Services
0904	Architectural	Lower	40-50	50-60
		Upper	50-60	60-70
0905	Bioengineering and Biomedical	All	40-60	60-80
0906	Chemical			
	Instrumentation	All	30-40	40-50
	Physical	All	60-100	70-110
	Chemical Processes	All	100-150	120-170
	Unit Operations	All	100-150	150-200
0907	Petroleum	All	100-150	150-200
0908	Civil, Construction, and Transportation			
	Soils, Photogrammetry	All	50-60	70-80
	Hydraulics, Concrete	All	80-100	100-120
	Strength of Materials	All	100-150	130-180
0909	Electrical, Electronics, and Communications			
	Measurements, Electronics, Communications	All	40-50	55-65
	Circuits	All	60-70	80-90
	Machines, Power	All	80-100	100-120
0910	Mechanical			
	Machine Shop	All	50-60	65-75
	Other	All	100-150	150-200
0911	Geological			
	Unit Operations	All	100-150	150-200
	Other	All	40-60	50-80
0912	Geophysical			
	Prospecting and Well Logging	All	80-100	100-120
	Other	All	40-60	50-80
0913	Industrial	All	100-150	120-170
0914	Metallurgical			
	Microscopy	All	40-50	55-65
	Physical	All	70-80	90-100
	Spectrography	All	100-150	150-200
0915	Materials	All	100-150	130-180
0916	Ceramic	All	60-80	100-150
0917	Textile	All	60-100	100-150
0918	Mining and Mineral	All	100-150	150-200
0919	Engineering Physics	Lower	30-40	45-55
		Upper	40-60	60-80
0920	Nuclear	All	100-150	150-200
0921	Engineering Mechanics	All	100-150	150-200
0922	Environmental and Sanitary	All	80-100	100-150
0923	Naval Architecture and Marine	All	100-150	150-200
0924	Ocean	All	100-150	150-200
0925	Technologies (Baccalaureate)	All	75-150	130-180
1000	FINE AND APPLIED ARTS			
1001	General	All	30-50	40-60
1002	(Studio) Art			
	Drawing, Painting	Lower	30-40	45-55
	Drawing, Painting	Upper	40-60	55-75
	Sculpture, Ceramics, Pottery	All	50-80	70-100
1003	Art History and Appreciation	All	15-20	20-25
1004	Music (Performing, Composition, Theory)			
	Individual Practice	All	40-80	60-90
	Group Practice	All	15-20	20-25
1005	Music (Liberal Arts)	All	15-20	20-25
1006	Music History and Appreciation	All	15-20	20-25
1007	Dramatic Arts	All	100-150	150-200
1008	Dance	All	60-90	75-100

TABLE 53 (continued)

(1)	(2)	(3)	(4)	(5)
			Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Course Levels	Excluding Services	Including Services
1009	Applied Design	All	50-80	70-100
1010	Cinematography	All	30-60	50-100
1011	Photography	All	30-60	50-75
1100	FOREIGN LANGUAGES	All	30-40	40-50
1200	HEALTH PROFESSIONS			
1201	General	All	30-50	60-80
1202	Hospital and Health Care Administration	All	20-25	25-30
1203	Nursing	All	30-50	50-60
1204	Dentistry	All	50-70	60-70
1205	Dental Specialties	All	50-70	60-80
1206	Medicine	All	30-50	60-80
1207	Medical Specialties	All	60-70	70-90
1208	Occupational Therapy	All	60-70	80-100
1209	Optometry	All	50-70	60-80
1210	Osteopathic Medicine	All	60-70	70-90
1211	Pharmacy	All	30-50	50-60
1212	Physical Therapy	All	60-70	80-100
1213	Dental Hygiene	All	50-70	60-80
1214	Public Health	All	30-40	40-50
1215	Medical Record Librarianship	All	25-30	30-35
1216	Podiatry	All	30-40	40-50
1217	Biomedical Communication	All	25-50	50-100
1218	Veterinary Medicine	All	40-150	150-200
1219	Veterinary Medicine Specialties	All	30-50	60-80
1220	Speech Pathology and Audiology	All	40-60	80-100
1221	Chiropractic	All	30-50	50-60
1222	Clinical Social Work	All	20-30	25-35
1223	Medical Laboratory Technologies	All	30-50	40-60
1224	Dental Technologies	All	50-70	60-80
1225	Radiologic Technologies	All	40-60	60-70
1300	HOME ECONOMICS			
1301	General	All	30-50	60-70
1302	Home Decoration and Home Equipment	All	30-50	60-70
1303	Clothing and Textiles			
	Materials	All	30-40	40-50
	Chemistry	All	40-50	50-60
	Design, Patternmaking, Costuming	All	50-60	60-70
1304	Consumer Economics and Home Management	All	70-90	80-120
1305	Family Relations and Child Development	All	25-30	40-50
1306	Foods and Nutrition			
	Taste Panel	All	20-25	30-35
	Chemistry	All	30-40	40-50
	Nutrition	All	40-50	60-70
	Experimental Cookery	All	50-60	70-80
1307	Institutional and Cafeteria Management	All	50-60	70-80
1400	LAW	All	20-30	25-35
1500	LETTERS	All	15-25	20-30
1600	LIBRARY SCIENCE	All	20-30	25-35
1700	MATHEMATICS	All	20-30	25-35
1800	MILITARY SCIENCES	All	20-40	30-50
1900	PHYSICAL SCIENCES			
1901	General	Lower	30-40	40-50
		Upper	40-60	50-80
1902	Physics	Lower	30-40	40-50
		Upper	40-60	50-80
1903	Molecular Physics	All	40-50	55-65
1904	Nuclear Physics	All	50-60	70-80
1905	Chemistry, General	All	30-40	45-55
1906	Inorganic Chemistry	All	40-50	55-65
1907	Organic Chemistry	All	50-60	70-80

TABLE 53 (continued)

(1)	(2)	(3)	(4)	(5)
			Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Course Levels	Excluding Services	Including Services
1908	Physical Chemistry	All	50-60	70-80
1909	Analytical Chemistry	All	40-50	55-65
1910	Pharmaceutical Chemistry	All	40-50	55-65
1911	Astronomy	Lower	25-40	30-50
		Upper	40-60	60-80
1912	Astrophysics	All	40-60	70-80
1913	Atmospheric Sciences and Meteorology	Lower	30-40	45-55
		Upper	40-60	70-80
1914	Geology	Lower	30-40	40-50
		Upper	40-60	50-70
1915	Geochemistry	All	40-60	50-70
1916	Geophysics and Seismology	All	40-60	50-70
1917	Earth Sciences, General	Lower	30-40	40-50
		Upper	40-60	50-70
1918	Paleontology	All	40-50	50-60
1919	Oceanography	Lower	30-50	60-100
		Upper	40-70	70-150
1920	Metallurgy	Lower	30-40	40-50
		Upper	40-60	50-70
2000	PSYCHOLOGY			
2001	General	All	20-30	25-35
2002	Experimental	Lower	30-40	40-60
		Upper	40-60	60-80
2003	Clinical	All	40-50	50-60
2004	Psychology for Counseling	All	20-30	25-35
2005	Social Psychology	All	20-30	25-35
2006	Psychometrics	All	25-35	30-40
2007	Statistics in Psychology	All	25-35	30-40
2008	Industrial Psychology	All	20-30	25-35
2009	Developmental Psychology	All	25-35	30-40
2010	Physiological Psychology	Lower	30-40	40-50
		Upper	40-60	60-80
2100	PUBLIC AFFAIRS AND SERVICES	All	20-35	25-40
2200	SOCIAL SCIENCES			
2201	General	All	25-40	30-50
2202	Anthropology	Lower	30-40	40-50
		Upper	40-50	50-60
2203	Archaeology	Lower	40-50	50-60
		Upper	50-60	60-70
2204	Economics	All	20-30	25-35
2205	History	All	20-30	25-35
2206	Geography	Lower	40-50	50-60
		Upper	50-60	60-70
2207	Political Science and Government	All	20-30	25-35
2208	Sociology	All	20-30	25-35
2209	Criminology	All	30-40	50-60
2210	International Relations	All	20-30	25-35
2211	Afro-American Studies	All	20-30	25-35
2212	American Indian Cultural Studies	All	20-30	25-35
2213	Mexican-American Cultural Studies	All	20-30	25-35
2214	Urban Studies	All	20-30	25-35
2215	Demography	All	25-35	30-40
2300	THEOLOGY	All	20-30	25-35
4900	INTERDISCIPLINARY STUDIES			
4901	General Liberal Arts and Sciences	Lower	20-30	25-35
		Upper	30-40	40-50
4902	Biological and Physical Sciences	Lower	30-40	55-65
		Upper	40-60	60-80
4903	Humanities and Social Sciences	Lower	20-30	25-35
		Upper	30-40	40-50
4904	Engineering and Other Disciplines	Lower	30-60	50-90
		Upper	40-80	75-125

TABLE 54

CLASS LABORATORY ASSIGNABLE SQUARE FEET PER STATION CRITERIA—TECHNOLOGICAL AND OCCUPATIONAL CURRICULA

(1)	(2)	(3)	(4)
		Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Excluding Services	Including Services
5000	BUSINESS AND COMMERCE TECHNOLOGIES		
5001	General	25-40	25-40
5002	Accounting	20-35	25-35
5003	Banking and Finance	20-35	25-35
5004	Marketing, Distribution, etc.	20-35	25-35
5005	Secretarial and Office Machine Training	25-40	35-50
5006	Personal Service	25-40	35-50
5007	Photography	30-60	50-75
5008	Communications and Broadcasting	30-50	50-100
5009	Printing and Lithography	40-60	50-70
5010	Hotel and Restaurant Management	25-50	35-55
5011	Transportation and Public Utility	30-100	40-160
5012	Applied, Graphic, and Fine Arts		
	Applied Arts	30-60	50-65
	Graphic Arts	30-65	60-70
	Fine Arts	50-100	100-150
5100	DATA PROCESSING TECHNOLOGIES		
5101	General	50-80	75-85
5102	Keypunch and Input Preparation	25-50	50-60
5103	Computer Programming	25-40	75-85
5104	Computer Operator	25-40	75-85
5105	Data Processing Equipment Maintenance	40-50	60-70
5200	HEALTH SERVICES AND PARAMEDICAL TECHNOLOGIES		
5201	General	25-50	45-55
5202	Dental Assistant	25-40	40-50
5203	Dental Hygiene	45-60	60-80
5204	Dental Laboratory	30-50	45-55
5205	Medical/Biological Laboratory Assistant	30-50	45-55
5206	Animal Laboratory Assistant	35-50	50-60
5207	Radiology	40-50	45-55
5208	Nursing, R.N.	25-50	45-55
5209	Nursing, Practical	25-50	45-55
5210	Occupational Therapy	25-40	35-45
5211	Surgical	40-50	45-55
5212	Optical	40-50	45-55
5213	Medical Record	25-40	40-45
5214	Medical Assistant	25-40	40-45
5215	Inhalation Therapy	25-50	45-55
5216	Psychiatric	25-35	35-40
5217	Electro-Diagnostic	25-50	45-55
5218	Institutional Management	25-35	35-40
5219	Physical Therapy	80-100	90-120
5300	MECHANICAL AND ENGINEERING TECHNOLOGIES		
5301	General	70-100	110-130
5302	Aeronautical and Aviation	100-150	130-180
5303	Engineering Graphics	40-50	50-60
5304	Architectural Drafting	50-60	60-70
5305	Chemical	80-100	100-120
5306	Automotive	100-150	130-180
5307	Diesel	100-150	130-180
5308	Welding	80-120	130-150
5309	Civil	80-100	100-120
5310	Electronics	40-50	60-70
5311	Electromechanical	60-70	100-120
5312	Industrial	100-150	130-180
5313	Textile	80-100	100-120
5314	Instrumentation	100-150	130-180
5315	Mechanical	100-150	130-180
5316	Nuclear	100-150	130-180
5317	Construction and Building	100-150	130-180
5400	NATURAL SCIENCE TECHNOLOGIES		
5401	General	35-60	50-70
5402	Agriculture	35-70	50-80

Table 54 (continued)

(1)	(2)	(3)	(4)
		Assignable Square Feet per Student Station	
HEGIS Code	Discipline Specialty	Excluding Services	Including Services
5403	Forestry and Wildlife	35-50	50-60
5404	Food Services	35-50	50-60
5405	Home Economics	35-60	50-70
5406	Marine and Oceanographic	35-50	50-60
5407	Laboratory, General	35-50	50-60
5408	Sanitation and Public Health	35-70	50-80
5500	PUBLIC SERVICE RELATED TECHNOLOGIES		
5501	General	25-35	30-40
5502	Bible Study or Religion Related	25-35	30-40
5503	Education	25-35	30-40
5504	Library Assistant	25-35	30-40
5505	Police, Law Enforcement, Corrections	25-35	30-40
5506	Recreation and Social Work Related	25-35	30-40
5507	Fire Control	25-35	30-40
5508	Public Administration and Management	25-35	30-40

Tables 53 and 54 were originally founded upon a similar table in *Guideline Procedures and Criteria for Campus Development and Capital Outlay Planning,* prepared by the Association of State Institutions of Higher Education in cooperation with Taylor, Lieberfeld, and Heldman, Inc. (April 1964), Table 8-1. However, the authors and their consultants have extensively modified the table to follow the *Taxonomy of Instructional Programs in Higher Education* of the National Center for Educational Statistics. In addition, the unit floor area values and proportions of service space have been changed, both in the establishment of ranges and in the magnitudes of those ranges. The values reflect the judgment of the authors and consultants based on their experience and the review of many published space inventories and planning criteria documents.

Section 3.6.

ESSAY ON THE INTERRELATIONSHIP OF UTILIZATION ASSUMPTIONS

In Sections 3.1.2 and 3.1.3 two methods of determining the required number of Stations were used. These were arbitrarily labeled Method X and Method Y.

These two methods result from two possible approaches to determining the required number of Stations. One method (Method X) is based upon using Weekly Student Hours as the basic program element. Under this method the required number of Stations is obtained by dividing the Weekly Student Hours by the assumed Station Utilization Rate. The second method (Method Y) is based upon using Average Section Size as the basic program element. Under this method the required number of Stations is obtained by dividing the Average Section Size by the Station Occupancy Ratio and multiplying that result (which is the average number of Stations per room) by the number of rooms.

Although these two methods can be shown to be *mathematically equivalent,* their application may yield *numerical results* which are different.

►Method X and Method Y are mathematically equivalent:

Method X

Given: $(N) = \frac{(WSH)}{(SUR)}$

But: $(SUR) = (RUR) \times (SOR)$

So: $(N) = \frac{(WSH)}{(RUR) \times (SOR)}$

But: $(RUR) = \frac{(WRH)}{(R)}$

So: $(N) = \frac{(WSH)}{(WRH \div R) \times (SOR)}$

Or: $(N) = \frac{(WSH)}{(WRH)} \times \frac{(R)}{(SOR)}$

But: $\frac{(WSH)}{(WRH)} = (AvSS)$

So: $(N) = \frac{(AvSS)}{(SOR)} \times (R)$

As given in Method Y

Method Y

Given: $(N) = \frac{(AvSS)}{(SOR)} \times (R)$

But: $(AvSS) = (WSH) \div (WRH)$

So: $(N) = \frac{(WSH) \div (WRH)}{(SOR)} \times (R)$

Or: $(N) = \frac{(WSH) \times (R)}{(SOR) \times (WRH)}$

But: $\frac{(R)}{(WRH)} = \frac{(1)}{(RUR)}$

So: $(N) = \frac{(WSH)}{(SOR) \times (RUR)}$

But: $(SOR) \times (RUR) = (SUR)$

So: $(N) = \frac{(WSH)}{(SUR)}$

As Given in Method X

►In the practical application of these two methods, different numerical results may be obtained, depending on the sequence of the calculations.

Consider the following example:

For a given biology laboratory type, these projected program data and utilization criteria are assumed:

Weekly Student Hours (WSH) = 1,760
Weekly Room Hours (WRH) = 80
Average Section Size (AvSS) = 22
Room Utilization Rate (RUR) = 22
Station Occupancy Ratio (SOR) = 0.80
Station Utilization Rate (SUR) = 17.6

In Method X the number of Stations required is

$$(N) = \frac{(WSH)}{(SUR)} = \frac{(1{,}760)}{(17.6)} = 100 \text{ Stations}$$

and the number of rooms is

$$(R) = \frac{(WRH)}{(RUR)} = \frac{(80)}{(22)} = 3.6 + = 4 \text{ Rooms}$$

Hence, this method indicates the need for four rooms with 100 total Stations. If, however, the average number of Stations per room, 25, is checked against the assumed Station Occupancy Ratio, then we find that

$$(SOR) = (AvSS) \div [Av(N/R)] = (22) \div (25) = 0.88$$

which is higher than the 0.80 which was initially assumed. Moreover, the actual room utilization is less than the assumed 22 hours per week:

$$RUR = (WRH) \div (R) = (80) \div (4) = 20$$

However, if the rooms are used to the full extent of the Room Utilization Rate, then the Average Section Size will be reduced to 20, because there will then be 88 Weekly Room Hours:

$$\begin{aligned} \text{WHR} &= \frac{(\text{WRH})}{(\text{R})} \times (\text{R}) \\ &= (22) \times (4) \\ &= 88 \text{ Weekly Room Hours} \end{aligned}$$

and

$$\begin{aligned} (\text{AvSS}) &= \frac{(\text{WSH})}{(\text{WRH})} \\ &= \frac{(1{,}760)}{(88)} \\ &= 20 \text{ Average Section Size} \end{aligned}$$

With the reduction of the Section Size to 20, the Station Occupancy Ratio of 0.80 is again possible:

$$\begin{aligned} \text{SOR} &= (\text{AvSS}) \div (\text{N/R}) \\ &= (20) \div (25) \\ &= 0.80 \end{aligned}$$

The reason for this variation is the necessity of building four rooms, rather than 3.6+ rooms. If it were possible to provide that fractional number of rooms, then no difference would result:

$$\begin{aligned} \text{SOR} &= (\text{AvSS}) \div (\text{N/R}) \\ &= (22) \div \frac{(100)}{(3.6+)} \\ &= 0.80 \end{aligned}$$

Because a whole number of rooms must be built, one of three decisions must be made, given four rooms with a total of 100 Stations:

►If the Station Utilization Rate is the important criterion, then there will be

SUR = 17.6		SUR = 17.6
RUR = 20	Or	RUR = 22
SOR = 0.88		SOR = 0.80
AvSS = 22		AvSS = 20

►If the Room Utilization Rate is the important criterion, then there will be

RUR = 22

SOR = 0.80

AvSS = 20

►If the Station Occupancy Ratio is the important criterion, then there will be

SOR = 0.80

RUR = 20

AvSS = 22

Method Y assumes that the Average Section Size is the important criterion. Assuming the same values used in the Method X, the number of Stations required increases to

$$
\begin{aligned}
N &= \frac{(AvSS)}{(SOR)} \times (R) \\
&= \frac{(22)}{(0.80)} \times (4) \\
&= (27.5) \times (4) \\
&= 110 \text{ Stations}
\end{aligned}
$$

Again, it is the necessity of rounding the required number of rooms to a whole number which causes the required number of Stations to be increased from 100 (in Method X) to 110 (in Method Y), because

$$
\begin{aligned}
N &= \frac{(AvSS)}{(SOR)} \times (R) \\
&= \frac{(22)}{(0.80)} \times (3.6+) \\
&= (27.5) \times (3.6+) \\
&= 100 \text{ Stations}
\end{aligned}
$$

If the decision is reached to provide 110 Stations, then

$$
\begin{aligned}
SOR &= (AvSS) \div [Av(N/R)] \\
&= (22) \div (110/4) \\
&= (22) \div (27.5) \\
&= 0.80
\end{aligned}
$$

$$
\begin{aligned}
RUR &= (WRH) \div (WRH/R) \\
&= (80) \div (4) \\
&= 20
\end{aligned}
$$

Thus, the assumed Room Utilization Rate of 22 hours per week cannot be attained if the Average Section Size and Station Occupancy Ratio are held firm.

In order to attain the assumed Room Utilization Rate of 22 hours per week, Average Section Size would need to be reduced to 20. This would have the effect of reducing the Station Occupancy Ratio to

$$
\begin{aligned}
SOR &= \frac{(AvSS)}{[Av(N/R)]} \\
&= \frac{(20)}{(27.5)} \\
&= (0.73+)
\end{aligned}
$$

In practice neither Method X nor Method Y can satisfy all of the original assumptions because fractional parts of rooms are impossible. The choice between the two methods depends upon the relative importance of the basic assumptions. Both methods permit attainment of the assumed Room Utilization Rate if Average Section Size can be reduced. In Method X this can be accomplished with fewer Stations at the assumed Station Occupancy Ratio; in Method Y this can be accomplished with more Stations but a lower Station Occupancy Ratio. On the other hand, if the Average Section Size cannot be reduced, then the assumed Room Utilization Rate cannot be attained in either Method X or Y. Both methods permit the attainment of the Station Occupancy Ratio if the Room Utilization Rate can be attained either by reducing Section Size or by increasing the Station Occupancy Ratio while reducing the Room Utilization Rate. The assumed Station Utilization Rate cannot be attained in Method Y.

Section 4.

THE DEVELOPMENT AND EVALUATION OF INSTITUTIONAL UTILIZATION CRITERIA FOR CLASSROOMS AND CLASS LABORATORIES

INTRODUCTORY COMMENTS

Previous sections of this manual have been limited primarily to the more mechanical aspects of determining classroom and class laboratory requirements. Although some Station area criteria have been suggested, methods of translating these numerical results into packages of space called buildings have not been discussed. Few guidelines have been given for the development of utilization criteria except that they should be developed by the institution, not by an outside agency. The relationship of scheduling to the utilization of classrooms and class laboratories has not been explored.

The development of building program statements is only briefly discussed elsewhere in these manuals. It is necessarily treated briefly because an exhaustive discussion would require an effort equivalent to that required for the development of these manuals.

Although it is not intended to be a complete discussion nor a definitive step-by-step procedure, this section considers in some detail some of the more important factors to be considered in the development of utilization criteria and their relationship to a few of the problems of scheduling classrooms and class laboratories.

Utilization criteria result from a complex set of interacting dynamic factors. Because they are based upon fundamental academic program considerations, utilization criteria are as unique to institutions as are programs. Because these programs are constantly being modified, so too must the utilization assumptions be changed. It is these differences between institutions and the unique dynamics of the academic programs within institutions that make national or statewide utilization standards so antithetical to the purposes of higher education.

Classroom and class laboratory utilization criteria are typically used in the three ways already discussed in Manual Two: in the evaluation of existing capacity, in the projection of requirements for a new institution, and in the projection of needs for an existing institution. This section will first discuss some of the limitations of typical utilization studies, then will offer some suggestions for their improvement (despite the limited utility of such studies). Finally, some basic factors related to the establishment of utilization criteria will be presented.

Section 4.1.

LIMITATIONS OF TYPICAL UTILIZATION STUDIES

DISCUSSION

Much, but not all, of the impetus for a typical utilization study has come from extrainstitutional sources, such as federal and state legislative bodies, educational coordinating councils, foundations, and state budgeting offices. All have been asked to support the expenditure of capital dollars for more college and university buildings. The legitimacy of their concern for optimum utilization of the facilities is beyond question. What is not beyond question is their understanding of the complexities involved in developing, applying, and interpreting optimum utilization standards. Some of the limitations of typical utilization studies are grouped together and discussed under the headings of

- Experimental design deficiencies
- Oversimplification of summary data and their interpretation
- Impossible or inappropriate demands

EXPERIMENTAL DESIGN DEFICIENCIES

Many utilization studies suffer from serious deficiencies of research design. Four of the many deficiencies which exist are discussed here.

Most utilization studies are designed to respond to an *improperly stated question,* "What is the present utilization rate for classrooms and class laboratories?" For many institutions the answer to that question has only led to invidious interinstitutional comparisons and sometimes to indefensible restrictions upon their building programs. Later in this discussion it will be suggested that a more appropriate question is, "What are the capacities of existing facilities to accommodate this institution's present and projected educational program?"

Most utilization studies *ignore institutional differences.* Size, geographical location, types of educational programs, and other institutional characteristics are basic indicators of the level of utilization which an institution can attain. Because institutions differ so extensively, particularly in their interactive combinations, it is necessary to develop unique institutional utilization criteria, rather than national or even statewide "all-in-one-bag" criteria.

Another limitation of many utilization studies is that their *focus is too narrow.* Typically they are limited to classrooms and class laboratories. Many people outside educational institutions tend to forget, or do not know, that colleges and universities also consist of faculty and administrative offices, research laboratories, libraries, residence halls, shops, power plants, athletic facilities, and many other supporting service facilities. Recent federal studies have indicated that classroom facilities averaged only six percent of the total space in large institutions (25,000 students and above) and only 11 percent of the total space for the smallest institutions (500 students and below). By contrast, residential facilities averaged more than one-fourth of the total space in all institutions and as much as one-third in some categories of smaller institutions.

Often there is a *lack of communication* between institutional representatives and those outside the institution. Usually utilization studies are limited to a summary of formally scheduled hours of use. Sometimes they are limited to scheduled use between 8:00 a.m. and 5:00 p.m. Persons unfamiliar with the limited scope of utilization studies may incorrectly assume the reported utilization rates include all forms of use, both formal and informal, without restriction.

OVERSIMPLIFICATION OF SUMMARY DATA AND THEIR INTERPRETATION

The use of overall averages to represent an assessment of the utilization of all rooms of a particular type is one of the more serious oversimplifications. For example, usually only a single Average Room Utilization Rate is reported for all classrooms within an institution. For a variety of reasons not all classrooms can be used equally effectively. For the convenience of certain programs like ROTC, physical education, and so on, it may be desirable to have some classroom space located near other facilities supporting such programs. The geographical location of such facilities, however, may make it undesirable to schedule those classrooms for other courses. Other considerations which may require differential categorization of classrooms before calculation of average utilization rates and ratios are such obvious factors as restricted locations within buildings, buildings which must be closed at an earlier hour than is typical, the quality of the space, the Station Count, the basic design of the room, and so on. Even the presence or absence of maps or other audio/visual equipment may be sufficient grounds for establishing differential utilization rates among classrooms.

Invalid analogies are frequently drawn in discussing the results of utilization studies. Often an industrial production analogy is used as though educational institutions were producing inanimate products of similar or identical characteristics. Further, the analogy is generally made without any acknowledgment that the capacity of an industrial operation is determined by its least productive machine or unit.

Lack of insight into the interdependence of physical facility resources represents a serious misunderstanding sometimes evident in the interpretation of utilization data. Nowhere is this misunderstanding more apparent than in statewide systems which provide capital support for all institutional building projects by ranking them according to the level of some previous year's classroom utilization. Because one way of raising the level of utilization is to admit additional students, while holding the instructional facilities constant, it may be necessary to add additional office space for additional faculty to teach the additional students, or additional residential space to house the additional students, and so on. Prohibiting the addition of all other types of space on the basis of low classroom or class laboratory utilization may, in fact, preclude a solution to the low utilization.

Lack of insight into the interdependence of total institutional resources also occurs in the interpretation of utilization data. Most proposals for increased utilization require additional resources such as additional operating dollars to hire the additional staff to teach the additional students who will fill the empty Stations. The utilization of classrooms and class laboratories cannot be studied in isolation, but must be an integral part of a total program management analysis.

IMPOSSIBLE OR INAPPROPRIATE DEMANDS

Some impossible or inappropriate demands are made by extrainstitutional agencies as the result of classroom and class laboratory utilization studies.

Sometimes *simplistic solutions* are suggested. For example, increased utilization may be demanded without considering whether this will result in real dollar savings or will cost more. In the process of improving room utilization, Section Sizes may be so diminished that the increased salary costs will exceed the expected capital dollar savings.

Sometimes *essentially antithetical actions* are required of the institutions. For example, increased Average Section Size may be requested in the same breath as increased room utilization and increased teaching hours for faculty when there is no increase in institutional student enrollments. It is quite likely that such a request is made without an understanding of the interactive effects involved. Increasing the Average Section Size under the conditions stated means lower room utilization unless some classrooms are abandoned or converted to other uses. Increasing the Average Section Size under the conditions stated also means fewer teaching hours per faculty member unless some faculty are dismissed. Increasing the Average Section Size with no increase in basic institutional enrollments probably means fewer courses available to students.

Sometimes *scheduling changes* are proposed as the solution to better utilization. Nothing betrays more ignorance of the real factors at work in the utilization of scheduled instructional facilities than a suggestion that the mechanics of scheduling determines utilization rates. In truth, they result from a complex set of academic decisions. Utilization rates are affected by total institutional enrollments, by maximum Section Size decisions, by the hours of instruction per week required of students taking a specific course, by students' decisions to enroll in certain courses (even though the times at which the courses are offered may affect that decision), by faculty workloads, by faculty leaves of absence, and by many other academic considerations. It is these academic elements which essentially determine the utilization rates of a given set of scheduled instructional facilities. At any fixed point in time only changing the amount of such facilities can change their rate of use. Only in projecting requirements for new institutions or in projecting major modifications or additions for existing institutions do principles of scheduling have any significant impact on the development of utilization criteria.

Section 4.2.

SUGGESTED IMPROVEMENTS IN UTILIZATION STUDIES

DISCUSSION

The limitations just cited have sometimes so frustrated institutional attempts to present legitimate capital outlay programs that some have suggested the best way to improve utilization studies would be to ban them altogether. The intent here is not to argue against utilization studies, but rather to put them in their proper perspective. Detailed studies of classroom and class laboratory utilization ought to be primarily of internal interest to educational institutions. Reporting of such data to outside regulatory agencies ought to be in support of total institutional resource requirements and in the context of total resource allocation. Toward that end some suggested improvements in utilization studies are grouped together under three imperatives:

►Improve the experimental design of utilization studies
►Tell the complicated truth about utilization studies
►Clarify the practical implications of utilization studies

IMPROVE THE EXPERIMENTAL DESIGN OF UTILIZATION STUDIES

The capacity of the institutional facilities to accommodate an educational program should become the primary focus of institutional studies of classrooms and class laboratories. Utilization studies traditionally have studied the use of classrooms and class laboratories during the preceding term and frequently have reported the results several months later. Issuance of the report usually has found the institution trying to defend what it has done but can no longer do anything about. The critics proclaim that until the institution does better (or as well as some other institution) it will not get support for something it believes it needs. If such studies are turned from a detailed introspection of what has been (utilization) to a comprehensive analysis of what can be (capacity), then perhaps the institution, its critics, and its friends will all be looking at a meaningful question with practical and alternative answers to which dollar savings and costs can be assigned.

1. *Recognize the implications of important institutional differences.* Certainly institutions can learn from each other, but too often invalid interinstitutional comparisons of utilization data have been made. Utilization criteria should not be unwittingly borrowed from other institutions no matter how similar they may seem to be. Precisely because institutional programs differ, utilization criteria must differ. Because differences in utilization criteria result from differences in programs, any evaluation of resource allocations should begin with the educational mission of each institution and not with levels of utilization.

2. *Evaluate classroom and class laboratory capacity in the context of all physical facility resources.* A complete room-by-room inventory of all institutional space is an indispensable data source which can give perspective to evaluative studies. Factual summaries help to dispel the popular misconception that the physical facilities of colleges and universities consist mainly of classrooms and class laboratories.

3. *Communicate clearly the fundamental assumptions, the limitations of the experimental design, the interaction among data elements, and the implications of the results inherent in utilization studies.* For example, assume the major motivation behind a classroom utilization study is extreme prodding for an institution to use its classrooms 50 to 60 hours per week. Further assume its present Average Room Utilization Rate (AvRUR) is 25 scheduled Weekly Room Hours (WRH) and its projected AvRUR is 30 WRH to be reached five to seven years from now. Perhaps only an extremely comprehensive study would effectively evaluate the academic and other consequences of reaching 50 to 60 hours of use, but there are some things which might be done to clarify the costs involved in attaining such a utilization level. First, it would be wise to reach agreement on what is meant by the term "use." Does it include only scheduled use by formally organized classes, does it also include other instructional use, or does it include all use? If hours of use other than formally scheduled hours are to be included, then a means for systematically collecting such data must be established and an analysis must be made of existing as well as projected hours of such use. Secondly, the necessary consequences of such utilization must be analyzed. One approach might be to investigate if any institution has reached such levels of scheduled utilization and, if so, to determine the characteristics of such an institution. Most likely it would have large enrollments, say 30,000 to 40,000 students. It would probably be located in a large city or near a large population center which would contribute large numbers of commuting students and a demand for late afternoon and evening courses.

It would probably have many part-time students who were not seeking a degree. Although it might have a core of full-time faculty, it would probably have large numbers of part-time staff recruited from the community; and it probably would have few, if any, cultural, athletic, and other extracurricular activities. Such are the characteristics of an institution which might reach 50 to 60 hours of scheduled classroom use. (It does not follow that institutions having some or all of these characteristics necessarily should or could attain such utilization levels.) But clearly, such an institution is not typical of most educational institutions. A typical educational institution is more likely to have a small enrollment (less than 2,000 students). It probably is located in a small community. Its students nearly all live "in residence," either in institutional facilities or in private dwellings in the community. The educational program is probably organized around full-time students in, or serviced by, the liberal arts, although some limited numbers of students may be enrolled in professional or preprofessional programs. The faculty is essentially full-time, in residence, and in the tenure system. Considerable opportunities most likely are available for student participation in cultural, athletic, and other extracurricular activities. Historically, the "price" of this more typical institution has been classroom utilization at the level of 25 to 30 hours per week. Beyond the fact that attaining 50 to 60 hours per week of classroom utilization may be practically impossible for the typical institution lies the fundamental question of whether the educational costs are worth the relatively minor capital dollar gains which might result from such a high rate of utilization.

TELL THE COMPLICATED TRUTH ABOUT UTILIZATION STUDIES

1. *Use appropriate statistical measures.* The almost exclusive use of overall averages, such as Average Room Utilization Rate (AvRUR), Average Station Utilization Rate (AvSUR), and Average Station Occupancy Rate (AvSOR), tends to obscure the fact that many highly utilized facilities are lumped together with less frequently used facilities to yield averages which may be typical of few, if any, of the total facilities. Two related solutions may be appropriate. First, if distributions of Weekly Room Hours (WRH) and Weekly Student Hours (WSH) are used rather than averages, then it is possible to classify classrooms and class laboratories by their level of use and consequently to analyze the reasons for their rate of utilization. For classrooms, such analyses are likely to show that low levels of utilization result from classrooms which are in remote campus locations, in buildings open only a limited number of hours, in locations precluding general institutional use, of poor quality, of inappropriate size for all but a few courses, required for other purposes at some hours (study areas, recreation, etc.), maintained during certain hours (set-up time, cleaning, repair, etc.), as well as from many similar program requirements. In addition to all of these factors, class laboratory utilization is greatly influenced by the limited number of academic courses it supports, sometimes by the small enrollments in such courses, and sometimes even by the time of day or time of year (as in an astronomical observatory, for example). From such analyses it is possible to determine just what improvements can be implemented and what facilities cannot be used more extensively. A second approach, which may result from the first, is to group facilities into meaningful categories. For example, one approach might be to group all classrooms into two levels of potential use (normal and restricted) and three levels of suitability (adequate, fair, and poor) and then to calculate for each of the resulting classifications an AvRUR, AvSUR, and AvSOR. Class laboratories, in addition, should be classified by Laboratory Type. While this second approach is not as comprehensive nor as meaningful as the first, it does provide for showing on a limited basis that not all classrooms (or class laboratories) are created equal.

2. *Avoid invalid analogies.* Colleges and universities are not like industrial concerns in many important respects. In fact, it is difficult to make a fair comparison even among educational institutions. If broad analogies between educational and industrial organizations must be made, it would perhaps be more appropriate to look at the utilization rates of service industries which have scheduled operations, such as the airline industry. Judged against airline utilization rates produced under the pressure of profit motive, educational institutions do an extremely effective job in the use of their instructional facilities.

3. *Show the interrelationship and interdependency of facility resources.* Increased utilization of instructional facilities is most likely to occur when institutional enrollments increase but instructional facilities hold constant or decrease. But additional students may result in the need for more residence halls, more faculty offices, more library space, and so on. Unless sufficient amounts of these noninstructional spaces are made available, it may be impossible to substantially increase the utilization rates of classrooms and class laboratories.

4. *Show the interrelationship and interdependence of all institutional resources.* It is not particularly difficult to identify institutional program characteristics which can lead to increased utilization of classrooms and class laboratories. Many of these have already been discussed. A careful analysis of all the elements quickly leads to the conclusion that maximum utilization of instructional facilities will very likely be counterproductive. For the fundamental question which must be raised concerning very high utilization levels is not whether they can be achieved but whether the price which must be paid for them is worth it. Many institutions may not be able to afford the educational and dollar costs of increased utilization. This does not mean that the utilization of classrooms and class labor-

atories is unimportant. It does mean that the optimum utilization of the total resources, including instructional facilities, is more important than the optimum utilization of any single resource.

In the final analysis increased classroom and class laboratory utilization results from such changes as more students, fewer courses, small Sections, more faculty, rigidly prescribed curricula, minimal student and faculty choice about their schedules, nonworking (and therefore subsidized) student populations, increased operating costs, additional capital costs for noninstructional facilities, and many other academic program and financial resource requirements. For many institutions these requirements imply educational costs which they are unwilling to pay just to achieve better utilization of a small portion of their physical plant. Even the supposed dollar savings are suspect. There is no question that, if given sufficient operating dollars to hire additional faculty to support additional subsidized students, the utilization of existing instructional facilities can be improved. But a cost analysis would quickly show that the one-time gain in capital dollars saved will be eroded quickly by recurring increases in operating expenses. Indeed, only when the total educational, operating, and capital costs of increased utilization are evaluated is the utilization of institutional facilities placed in its proper perspective.

CLARIFY THE PRACTICAL IMPLICATIONS OF UTILIZATION STUDIES

1. *Beware of the simplistic solutions* which often result from utilization studies. In the final analysis the real purpose of classrooms and class laboratories, or of any facilities for the matter, is to support the program of the educational institution. The objective becomes perverted when increased utilization becomes such an important requirement that the educational program is diminished.

   The best protection against these simplistic, misdirected, and counterproductive demands for improved utilization is to continuously *evaluate the educational, operating, and capital costs of alternate program decisions.* It is somewhat ironic that classroom space, which is some of the least expensive space to build and which constitutes such a small percentage of the total space in many institutions, should be the major, continuing focus of attention in resource utilization. Even though the utilization of instructional facilities has received attention out of all proportion to its real importance, the pressure for improved classroom and class laboratory utilization is not likely to abate until external agencies fully understand the complexities of the many interacting factors involved. Continuous studies which evaluate the total program management system are needed to help explain the many program decisions that determine the total resource requirements. One such study might show, for example, that because classrooms cannot be easily added in the incremental manner in which students are added all of the classroom space required for the next ten years has to be constructed now. Consequently, the optimum expected utilization will not be reached until that time. Such continuing studies, if they did nothing else, would change utilization studies from inadequate analyses to program analysis and planning.

2. *Study and evaluate the relationship of scheduling to utilization.* The factors involved in scheduling and achieving optimum utilization levels are interrelated and complex. While some of these interrelationships are known from analytic studies and others are reasonably evident from intuitive analyses, many remain to be fully explored. Although a study of sufficient detail to untangle all of these interrelationships may prove to be more costly than the ultimate savings in facility requirements, perhaps such an exhaustive study will be worth the price if it can put to rest, once and for all, the naive assumption that great potential financial savings can come from increased utilization by way of scheduling improvements. Some of the factors pertinent to such a study are outlined in the next section.

Section 4.3.

THE DEVELOPMENT OF CLASSROOM AND CLASS LABORATORY UTILIZATION CRITERIA

DISCUSSION

The detailed procedures for evaluating and projecting classroom and class laboratory needs suggested that utilization criteria be determined by each institution. Perhaps the suggestion that institutions should individually determine utilization criteria for their instructional facilities will be viewed with skepticism in some circles. Although the establishment of utilization criteria by extrainstitutional agencies would not alter the computational procedures developed in this manual, such an imposition of standards would probably diminish, perhaps negate, the educational values which can result from placing utilization decisions in the hands of the institution. The establishment of optimum utilization standards requires a complex set of interdependent academic decisions. The resulting criteria are unique to each institution. Hence, common standards should not be set for groups of institutions. If external agencies genuinely desire to affect the level of use for institutional facilities, they must first fully understand the basic complexities of the decisions which underlie the establishment of utilization criteria. They cannot, on the one hand, impose criteria which bring efficiencies to one area yet remain free, on the other hand, to criticize consequent inefficiencies in other areas which also result from the criteria they themselves imposed. However classroom and class laboratory utilization criteria are developed, the factors which help to determine them must be understood both within and without the institution.

Utilization criteria can be developed for such an all-encompassing criterion as ASF/WSH or for the component parts of such a criterion. Because the detailed procedures of Manual Two are based upon the component parts, the factors affecting the development of RUR, SOR, and ASF/N will be discussed here. The Station Utilization Rate (SUR) is not included because it is a function of the RUR and the SOR; the ASF/WSH criterion is not included because it is a function of the three criteria which are discussed. Therefore, the principal considerations of this section are

- ►Factors which affect the Room Utilization Rate (RUR)
- ►Factors which affect the Station Occupancy Ratio (SOR)
- ►Factors which affect the Assignable Square Feet per Station (ASF/N)

For ease of discussion and understanding, the effects of various program characteristics or decisions on each utilization criterion are enumerated separately. In each case the underlying assumption is *other things being equal.* For example, the addition of more students (to the institution and in the courses now offered) will cause the AvSOR to increase, if nothing else is changed. The discussion is largely limited to identifying the tendency of various factors to increase or decrease each of these utilization measures. Two opposing factors cannot be assumed to cancel each other out; only a careful quantitative analysis based on the set of data specific to each institution can identify the net effect.

FACTORS WHICH AFFECT THE ROOM UTILIZATION RATE

1. Institutional characteristics are sometimes symptomatic, sometimes causative in RUR determinations.

   (a) **Size of institution**
   In general, larger institutions can attain higher room utilization than smaller ones (less than 1,000 students). Large institutions usually have many multiple-Section courses, as well as other scheduling flexibilities that accompany large numbers. Large institutions usually have sufficient demand for a specialized class laboratory or a classroom with a certain Station Count or design to justify building it. Small institutions, on the other hand, must be quite imaginative and attempt to build mutipurpose instructional facilities. Because there are real limits to the amount of flexibility that can be achieved, small institutions find that they must provide at least a basic core of instructional facilities. Although these basic facilities must be equal to the educational program requirements in scope, they cannot be optimally used. There is only sufficient enrollment to require the facilities, not enough tc fill them.

   (b) **Age of institution**
   Relatively new institutions are more likely to have lower Average Room Utilization Rates than longer established institutions. In part this may be due to the smaller size of a new institution, but it also results from effective planning. New institutions must

plan either for their projected ultimate size or for some reasonably distant target date. Classrooms and class laboratories cannot be easily or inexpensively added in as small increments as students are usually added from one year to the next. Thus, if sufficient instructional facilities are planned for the next ten or fifteen years of enrollment growth, many classrooms and class laboratories will not be fully utilized in the intervening years.

(c) **Location of institution**
Institutions located in or near large population centers probably have more potential for a higher AvRUR for classrooms. If the institutional program is responsive to the many potential community interests, it can develop several academic programs which will attract several different populations of students. Such populations are necessary in order to have high levels of classroom use (greater than 25 or 30 hours). However, because different populations of students tend to bring different interests, they usually do not bring higher class laboratory room use, but rather a demand for additional (and different) class laboratories.

(d) **Type of institution**
Liberal arts colleges and multiple-program universities are less likely to be able to reach a high AvRUR than institutions with more narrowly defined educational programs. This generalization holds true only to the extent that in these latter institutions student programs (and therefore their schedules) can be more accurately forecast.

(e) **Numbers of part-time faculty**
In an economy which is moving toward reducing the length of the work week, many institutions are reluctant to demand that faculty teach at widely different hours. As a consequence, it is difficult to reach high levels of AvRUR. Institutions that find it possible to employ large numbers of part-time faculty are better able to use the less popular hours of the day and can achieve higher room utilization levels.

2. Program decisions are some of the most decisive factors in setting Room Utilization Rates.

(a) **Diversified programs**
The effect on the RUR of diversified educational programs with an abundance of electives is not clear-cut. On the one hand, diversified programs tend to make a higher Room Utilization Rate possible because they encourage more (and consequently smaller) Sections. On the other hand, because scheduling predictions are more unstable, an excess of rooms (greater than normal) is needed to protect against the scheduling uncertainties.

(b) **Noninstructional activities**
Students cannot be in two places at once. An institution which encourages or permits extensive student participation in social, cultural, athletic, or other extracurricular activities will tend to have lower instructional room utilization (assuming the RUR reflects only scheduled use by formally organized classes). Because the hours at which these noninstructional activities occur will conflict with some of the hours scheduled for instructional activities, the total hours available for engaging in either or both of these activities are diminished. Classrooms cannot be filled if the auditorium or the stadium is.

(c) **Course requirements**
The many requirements associated with a particular course have various effects on utilization rates. The most significant requirement for room utilization is the number of scheduled hours of instruction required in classrooms or class laboratories. The larger this requirement is, the more room hours are required and the higher the RUR tends to be. (While the addition of scheduled class time to existing courses is a theoretical way of increasing the RUR, no one is likely to seriously suggest such an action, since it would probably lead to higher operating costs in the form of additional faculty.)

(d) **Section Size**
The maximum Section Size is normally established as an instructional decision, although unfortunately it is sometimes dictated by the Station Count of available facilities. As the Average Section Size becomes larger, the RUR tends to decrease, because there are fewer Sections to use the same number of rooms. Setting minimum sizes for Sections, below which they will not be taught, also tends to lower the RUR because it is just another way of increasing Average Section Size. (Note that in the broader context of program management, this tendency for larger Sections to lead to less room utilization runs counter to the tendency for larger Sections to produce more efficient operating costs.)

(e) **Facilities management**
At any point in time it is possible to increase the AvRUR by abandoning or converting to other purposes some of the existing instructional facilities. However, the long-range plan of the institution must be considered. It would be unwise to abandon or convert currently underutilized facilities if they will be needed in the years immediately ahead.

(f) **Numbers of students**
One way to increase the RUR is to admit more students. It is theoretically possible to increase student enrollments without affecting the RUR. In practice, however, additional students usually result in additional course Sections and, therefore, increased utilization of existing rooms.

(g) **Numbers of faculty**
In general, the more faculty there are available to

teach, the greater the number of Sections and the smaller the Average Section Size will be. Although this makes a higher AvRUR possible, it also causes higher operating costs.

3. Faculty decisions also affect Room Utilization Rates.

   (a) **Time preferences**
   A few institutions have available large numbers of part-time faculty, many of whom are willing to teach at night in addition to a regular job in business or industry. But the majority of institutions have a regular full-time faculty, perhaps with a few lecturers or other part-time staff. Thus, in most institutions, the preponderance of choice among faculty members for teaching hours falls between 9:00 a.m. and 2:00 or 3:00 p.m. With proper incentives, perhaps as much as ten to fifteen percent of the WRH can be scheduled in the 7:00-10:00 p.m. time period. These relatively restricted times at which instructional facilities can be scheduled tend to restrict the optimum size of the RUR criteria, even though at the same time operating costs tend to be reduced by reason of larger Average Section Sizes.

   (b) **Distribution of effort**
   Faculty members, particularly in large universities, usually devote some portion of their effort to research and other nonteaching activities. Often the "price" paid for extensive research activities is an abundance of large lecture Sections. The resultant larger Average Section Size is reflected in a smaller AvRUR. In general, the fewer the number of weekly contact hours per faculty member, the larger the Average Section Size and consequently the smaller the AvRUR.

   (c) **Teaching methods**
   Teaching methods affect the RUR in many ways. In many institutions there is a discernible trend toward less formal teaching methods. One of the more dramatic examples of this is described in Manual One in the essay on Colorado College. For Colorado College a classroom has become a courseroom and the whole concept of "hours per week of room use" is irrelevant. Even though changes in teaching methodology in many other institutions may be less pronounced, there probably will be increasingly less demand on existing facilities. The trend seems to be toward less formalized teaching procedures. Because most of the facilities will probably need to be retained, the AvRUR is likely to decrease in the years immediately ahead. Note, however, that this may not be a decrease in actual use, but in scheduled use.

4. Student decisions sometimes influence Room Utilization Rates.

   (a) **Time preferences**
   Although colleges may be somewhat reluctant to admit it, many students choose some of their courses, especially electives, on the basis of the time at which they are scheduled. Room Utilization Rates are lowered because this practice discourages the scheduling of rooms at the more unpopular hours.

   (b) **Distribution of effort**
   If the only activity in which students engaged were to go to class, the maximum utilization of instructional facilities would be a relatively easy matter. However, students also spend time studying, working, socializing, participating in sports, and sleeping. Partly by tradition and partly out of necessity certain loosely defined blocks of time are used for these activities. By the choices available to them students protect their interests in these nonclassroom activities and thereby limit the range of hours in which formalized classes can be scheduled.

   (c) **Program choices**
   Not too many years ago the employment opportunities for college graduates were heavily weighted toward the sciences and toward the teaching professions at all educational levels. Recently opportunities have changed drastically in these and other areas. As changes in the job market occur so do students' choices in programs. A shift from the sciences to the social sciences may mean that, on the average, students spend less time in small laboratory and quiz Sections in the sciences and more time in large lecture Sections in the social sciences. As a result of such a change, the RUR of class laboratories and classrooms would probably decrease. In other situations the reverse might occur. The important point to be remembered is that major shifts in student interest may influence the RUR.

5. Room characteristics may affect the RUR.

   (a) **Campus location**
   On many campuses, particularly those which are extensive, some classrooms are located in remote locations. Although such rooms may be useful to a particular program in that location, their use by others would involve considerable sacrifice of time. The RUR criterion for remotely located classrooms should be appropriate to their reasonably expected use.

   (b) **Functional accessibility**
   Sometimes an instructional room is located in a building in such a way that general use is impossible or discouraged. For example, a classroom may be placed adjacent to a class laboratory so that the students can move to it from the laboratory for group discussions whenever they are appropriate. This preemptive use of the classroom makes its use by other classes impossible when the class laboratory is scheduled. Even when the classroom is not used in

this way, noise from the adjacent laboratory may preclude use of the classroom.

(c) **Design**
Many factors associated with the design of a room, some of them subtle, affect the desirability of some classrooms and class laboratories as places in which to learn. Long, narrow rooms; poorly lighted rooms; rooms crowded with furniture; and noisy rooms are undesirable. It is not always possible to tell in the building planning process what impact some of these design decisions will have on the RUR. After instructional rooms have been used for several years, it may be necessary to adjust the originally assumed RUR criteria upward or downward on the basis of these qualitative aspects.

(d) **Station Count**
In general, a lower Room Utilization Rate may be appropriate for the classrooms with the largest Station Counts. No generalization concerning the RUR for the smallest classrooms is justified.

(e) **Suitability**
The most obvious example of the impact of suitability on the RUR occurs in the case of class laboratories, but even the presence or absence of audio/visual equipment in a classroom may affect the utilization rate. Sometimes the suitability tends to restrict use (as in class laboratories) and therefore lowers the optimum level of use. Other times it enhances the utility of a room (as in the case of an audio/visual capability) and therefore increases the expected utilization rate.

(f) **Availability**
For scheduling purposes, an institution usually delimits the instructional week. For example, this may be from 8:00 a.m. to 10:00 p.m., Monday through Friday. Even though all rooms used for instruction physically exist during all of these hours, some are not available for instructional use. Blocked time, building security, and multiple uses are a few of the reasons for this. "Blocked time" is a term used to define regular instructional hours for which a room cannot be scheduled for classes because it must be used for setting up demonstrations or for similar activities. Sometimes buildings with open designs are locked at the time the offices in them are closed; if such buildings contain classrooms or class laboratories, those rooms also are unavailable after office hours. Multiple-purpose rooms in residence halls are sometimes used as classrooms in the daytime and as study rooms or recreation rooms during the evening. Blocked time, building security, and multiple use are only a few reasons why rooms must have differential RUR criteria. These criteria should reflect the hours each room is available for actual instructional use, not an average number of hours applied to all rooms.

(g) **Condition/quality**
The more inadequate the condition of a room, the less likely it will be used. Evaluating the condition of a room depends upon many qualitative judgments ranging from some of the more obvious items of maintenance and repair (condition of painting, lighting, seating, chalkboard, etc.) to less easily measured characteristics (acoustics, ambient noise level, etc.) to emotional reactions to the room.

6. Scheduling decisions may affect the RUR.

(a) **Centralized scheduling**
In general, the utilization of instructional facilities will be enhanced by placing the responsibility for scheduling in one central office of the institution such as the registrar's office. Large institutions which assign the instructional facilities to several organizational units for independent control and scheduling exhibit utilization rates which are of the same order of magnitude as rates in small institutions. Indeed, in many respects, highly decentralized universities are simply a collection of relatively small colleges.

(b) **Scheduling matrix day-hour patterns**
Most colleges and universities use a scheduling scheme which allows a class to meet at the same hour (or hours) each day for whatever number of days are necessary to meet the course requirements. For example, a typical class may meet Monday, Wednesday, and Friday from 9 to 10:00 a.m. Under this system some hours are more popular than others and overall utilization tends to be lower. A few institutions have used a scheduling pattern which deliberately includes a combination of popular as well as unpopular hours. One such system is a 39-hour matrix with 13 three-hour patterns. Hours can be dropped from one pattern to accommodate classes of less than three hours, or two or more patterns can be combined for courses requiring more than three hours. A three-hour course may meet Monday at 9:00 a.m., Wednesday at 8:00 a.m., and Friday at 3:00 p.m.; or a five-hour course may meet Monday at 9:00 a.m., Tuesday at 10:00 a.m., Wednesday at 8:00 a.m., Thursday at 4:00 p.m., and Friday at 3:00 p.m. The fortieth hour in this matrix is retained as a free all-college hour for meetings. With this random scheduling pattern the pressure for classes at popular hours tends to be removed, and room utilization is increased.

(c) **Scheduling matrix size**
The RUR can increase in direct proportion to the size of the scheduling matrix. Because a scheduling matrix which permits the scheduling of classes from 8:00 a.m. to 10:00 p.m. five days a week has more available hours than one in which the hours are restricted to 8:00 a.m. to 5:00 p.m. five days a week, it can produce fewer time conflicts, smaller Average Section Sizes, and higher Room Utilization

Rates. (Note, however, that in practice faculty and student time preferences may counteract the potential effects of a large matrix.)

(d) **Scheduling matrix development**
The time at which courses will be offered can be specified before students register for courses or after they make a course selection. Preregistration scheduling is most typical; creating a schedule after course selection is more typical of computer scheduling. In practice, computer capacity and program capabilities may impose some rather rigid limitations on many of the free (and largely uncharted) choices which characterize the more traditional registration systems. In general, postregistration scheduling by computer should lead to the most effective use of instructional facilities. Postregistration scheduling, however it is accomplished, should lead to more efficient utilization than student selection from prescheduled courses.

(e) **Course conflict matrix**
The total number of instructional rooms available defines the total number of courses which can be taught at one time and, therefore, the maximum number of course conflicts which can occur at any one time. Because most time schedules for course offerings are not completely rebuilt each time, but rather reflect a refinement of previous schedules, the course conflicts critical to a student's progress toward a degree tend to be removed. In general, this removal of course conflicts in students' schedules works toward increased room utilization because predictions of the number of rooms required become more stabilized.

(f) **Multi-Sectioned courses**
Because multi-Sectioned courses make it easier to develop conflict-free faculty and student schedules, they contribute to increased room utilization. Occasionally, under the guise of reducing teaching costs, a multi-Sectioned course is changed to one or two lecture Sections. The direct effect, of course, is a decreased RUR. Sometimes there are compounding effects. If the course is a required course for all students of the same class level (e.g., all freshmen), then the requirement that all such students be in that lecture at the same time precludes the offering at that time of any other courses required for students of that class level.

(g) **Section Size predictions**
The procedures for projecting classroom and class laboratory requirements are dependent upon predicting the numbers of students who will enroll in each Section of each course. Because a considerable amount of error is to be expected with such predictions, some excess capacity must be available. Having too few instructional rooms is disastrous to the educational program; having too many is poor planning; having some excess is a practical necessity, not only to guard against imperfect predictions, but also to allow for changes in instructional techniques.

(h) **Frequency of course offerings**
Usually the frequency of course offerings is based upon student demand, although it also depends upon the number of faculty available to teach the courses. For purposes of determining RUR criteria, the more frequently offered courses tend to increase room utilization because they add stability to predictions of Section Size and numbers of Sections.

(i) **Noninstructional activities**
Sometimes in the planning of instructional facilities, particularly classrooms, it is intended that the rooms also be used for purposes other than classes. For example, classrooms may be built in the library to be used as classrooms during the daytime and as study rooms at night, or they may be located in residence halls to be used as classrooms part of the time and as study or recreation rooms at other times. Because the RUR criteria, by definition, can only reflect scheduled hours of use by formally organized classes, rooms which will have higher levels of noninstructional use should be assigned lower RUR criteria.

FACTORS WHICH AFFECT STATION OCCUPANCY RATIO

Many of the factors which affect the Station Occupancy Ratio are the same as those which influence the Room Utilization Rate. Frequently, however, the factors which tend to raise the RUR may lower the SOR, and vice versa. Section Size is by far the most pervasive factor in all of the decisions which affect the establishment of SOR criteria.

1. Institutional characteristics tend to be related to the SOR in the same way as they are to the RUR in three instances, but are indeterminate in two others.

   (a) **Size of institution**
   In general, a larger institution can attain higher Station Occupancy Rates than a smaller one (less than 1,000 students). Because a smaller institution has nearly the same range of Station Counts as a large institution but has far fewer numbers of Sections, the discrepancy between the Average Station Occupancy Ratio and the Station Count will be greater than it will be for a large institution where greater numbers of Sections can permit a closer match between the Average Station Occupancy Ratio and Average Station Count.

   (b) **Age of institution**
   Relatively new institutions are more likely to have lower Station Occupancy Ratios than longer established institutions. In part, this may be due to the

smaller size of a new institution, but it also reflects effective planning. A new institution would be ill-advised to build instructional facilities with Station Counts based on current Section Sizes. Ultimate Section Sizes and projected numbers of Sections of each size must form the basis for determining Station Counts. Until those projected numbers are realized, the SOR will be lower than the criterion values used in planning.

(c) **Location of institution**
The geographical location of an institution has no predictable effect on the SOR. It is probable, however, that location will affect the SOR differently than the RUR. As the RUR increases, the SOR tends to decrease because the discrepancy between Station Count and Section Size is increased.

(d) **Type of institution**
Liberal arts colleges and multiple-program universities are less likely to achieve a high AvSOR than institutions with more specialized educational programs. In educational programs where the curriculum is either limited or rather specifically prescribed, course enrollments can more accurately be predicted and, hence, the SOR could be higher.

(e) **Numbers of part-time faculty**
Numbers of part-time faculty have no predictable effect on the SOR. However, because large numbers of part-time faculty tend to increase the RUR, it is possible that the SOR will be decreased.

2. As in the case of the RUR, program decisions are some of the most decisive factors in determining SOR criteria.

(a) **Diversified program**
Although diverse educational programs and extensive course electives do not have readily predictable effects on the SOR, they probably diminish the SOR because of less stable course enrollment predictions.

(b) **Noninstructional activities**
The effect of student participation in noninstructional activities on the SOR cannot be forecast, although the absence of the opportunity for such participation probably makes it easier to predict Section Sizes and therefore tends to raise the level of the SOR.

(c) **Section Size**
Throughout this listing of factors which affect the SOR, the most important underlying determinant is Section Size. In general, the SOR reaches an optimum value for Station Counts which most nearly approximates the Average Section Size. Alternatively, the SOR tends to decrease as the Station Count becomes larger or smaller than the Average Section Size. Note that effective planning requires that the AvSS which is used to establish SOR criteria should be an eventual optimum value, not a current one, unless the institution now has its ultimate enrollment ~~and the present~~ distribution of students among Sections is likely to remain stable, or unless major additions of instructional facilities are still to come which will provide opportunities for establishing new Station Occupancy Rates.

(d) **Facilities management**
At any point in time an institution has a fixed demand for Stations and a fixed number of Stations. No amount of rescheduling can change the SOR at that point in time. Once students have chosen their courses, only one means of improving the SOR is available; that is to remove Stations. However, this may be inadvisable on two counts. First, unless the Stations which are removed constitute one or more rooms, nothing is saved. Stations which are removed here and there from rooms bring no effective gain in space. Second, unless the institution has reached its ultimate enrollment level and its final distribution of students among Sections, it is unwise to abandon presently unused Stations which may be needed in the years immediately ahead.

(e) **Numbers of students**
Although the only way to affect the SOR at some fixed point in time is to alter the number of Stations, the most effective means of influencing the SOR over a period of time is to change the number of students who are enrolled. If the number of Stations is held constant and more students are admitted, the SOR will increase. It is possible, of course, that the increase in the number of students will be accompanied by the need for more faculty as well as the need for more facilities such as offices, study rooms, or residence halls.

(f) **Numbers of faculty**
The number of faculty available to teach has no necessary effect on the SOR. The tendency is probably in the direction of a lower SOR when the number of faculty is greater, if it can be assumed that greater numbers of faculty would increase the number of Sections, which would increase the RUR, which would, in turn, decrease the SOR.

3. The impact of faculty decisions on the Station Occupancy Ratio is minimal. Only as such decisions have an impact on Section Size do they affect the SOR.

4. Like faculty decisions, student decisions have little impact on the Station Occupancy Ratio. Section Size again is the important factor.

5. Most of the room characteristics noted in connection with the RUR are irrelevant to a discussion of the establishment of SOR criteria. However, certain Station characteristics are pertinent.

(a) **Maximum Station Count**
The Station Count in the largest room(s) is a decision which for most institutions must be based not only on projected Section Sizes, but also on numbers of people who will make noninstructional uses of the room(s). An institution may decide, for example, that the largest room must be able to accommodate all of the students in the freshman class. Because that number of Stations is likely to be larger than the number resulting from any instructional requirements, the SOR criterion will be lower than it would be if this noninstructional use were not necessary. The intelligent use of capital resources, of course, is the factor of influence in such a decision. Even in institutions which do not anticipate noninstructional use, or at least any use by a group whose numbers exceed the largest projected Section Size, caution must be exercised lest the SOR be set too high. The danger to be avoided is the scheduling of small groups into very large lecture rooms. Although that is numerically possible, it is often educationally undesirable.

(b) **Minimum Station Count**
For several good reasons many institutions set a lower limit on the Station Count for the smallest rooms. Sometimes this lower limit has been set as high as a Station Count of 30; sometimes it has been as low as 10; more typical, perhaps, is 20 or 25 Stations. Among others, there are two important reasons for establishing a minimum Station Count. First, it is desirable for maximum scheduling flexibility. Although it is possible to predict the distribution of Section Sizes with some accuracy, it is not possible to predict the precise size of each Section. Hence, a distribution of Station Counts which too closely approximates the distribution of Section Sizes will cause considerable reshuffling of classes following registration (or require students and faculty to travel to inconvenient locations in a post-registration scheduling system). Secondly, principles of design and cost-effectiveness require that buildings be planned with some modicum of architectural reasonableness, which generally expresses itself in some modular scheme. Space and cost analyses show that a classroom of 15 Stations is not one-half as large, nor one-half as expensive, as one of 30 Stations. It is more likely two-thirds or at least three-fifths as large and as expensive. In general, the smaller the Station Count, the greater the unit area per Station and the greater the unit cost per Station. Thus, the initially greater cost of seting a minimum Station Count may be more than offset over a period of time by the savings which result from more efficient space management. The higher the minimum Station Count is set, the lower the SOR for rooms of that minimum Station Count must be set.

(c) **All Station Counts**
To some degree the considerations which affect the decisions of maximum and minimum Station Counts are pertinent to the establishment of SOR criteria for all Station Counts. Any instructional room may be required for noninstructional use from time to time. Each institution must carefully consider the extent of its noninstructional activities and the degree to which its instructional rooms must be designed with sufficient Stations to meet other needs. Further, three considerations must be kept in mind. First, the future must be anticipated. A growing institution should set its Station Counts not on current Section Sizes, but on predicted Section Sizes for some relevant target year. Second, as noted in the discussion on minimum Station Counts, the per-Station cost in rooms with fewer Stations tends to be higher. Third, a distribution of Station Counts which too closely approximates the distribution of Section Sizes creates potential scheduling problems. Thus, if the institutional intent is to provide maximum support to the educational program, rather than to maximally utilize facilities whatever the cost to the educational program, the SOR criteria will be set lower than higher. The SOR can be somewhat higher for Station Counts which approximate the highest frequencies of Section Sizes; it should be lower for the larger Station Counts; it should also be lower for the smaller Station Counts if the minimum Station Count is high compared to the projected Section Sizes.

(d) **Flexibility**
Few words have more educational and architectural appeal than "flexibility." Few concepts are more difficult to realize. Despite the hazards, colleges and universities, particularly small ones, must continually search for imaginative solutions to the multipurpose use of their facilities. Few solutions have been more popular than the use of folding partitions to subdivide larger spaces into smaller ones. Folding partitions offer one solution to increasing the SOR if they are used after they are installed. Two factors primarily determine the effectiveness of divisible spaces. First, the design of the partition must be an effective sound barrier. Second, the partition must be put in place and then moved by someone at the appropriate time as often as is required by the scheduled use of the room. Experience to date for most installations is not encouraging. Sound transmission is a typical problem and few partitions are ever moved.

6. Many of the scheduling decisions which affect the RUR also influence the SOR, although not always in the same way.

(a) **Centralized scheduling**
For institutions of comparable program and size, those which centrally schedule their instructional facilities should be able to attain higher Station Occupancy Ratios than those which schedule on a decentralized basis. Because institutions which

schedule on a decentralized basis resemble a collection of small institutions, the factors involved are essentially the same as those discussed in connection with size of institution.

(b) **Scheduling matrix size**
The effect of the size of the scheduling matrix on the SOR is not fully predictable, although one possible effect is evident. A larger matrix provides more scheduling opportunities to use a room with a Station Count that approximates the Section Size and, hence, operates in the direction of higher Station Occupancy Rates.

(c) **Scheduling matrix development**
The method by which, and point in time at which, the scheduling matrix is developed has the same impact on the SOR as on the RUR. Postregistration scheduling by computer should permit the establishment of higher SOR criteria than manual postregistration scheduling. Postregistration scheduling by any means should encourage higher SOR criteria than registration based upon prescheduled courses.

(d) **Course conflict matrix**
The historical resolution of course conflicts does not directly affect the SOR. However, the development of new schedules by refining old ones does provide a mechanism for increasing the SOR, provided the net effect of such changes is to make the Station Count and Section Size distributions more nearly alike.

(e) **Multi-Sectioned courses**
Institutions that have large numbers of multi-Sectioned courses in which most Sections of each course are nearly the same size should be able to establish higher SOR criteria than comparable institutions with lesser numbers of such Sections. Multi-Sectioned courses of predictable Section Sizes provide a certain amount of stability on which to base estimates of required Station Counts. At the same time any educational program changes which call for an increase (or decrease) in Section Size for large-enrollment, multi-Sectioned courses will cause a corresponding increase (or decrease) in the SOR.

(f) **Section Size predictions**
As noted above in discussing program decisions, nothing is more critical to the establishment of SOR criteria than the ability to estimate the Section Sizes that will be obtained in the target year for which predictions are made. Among others, two compelling reasons for providing excess Station capacity stand out. First, few, if any, institutions have such fixed enrollments and such prescribed programs that infallible Section Size projections can be made. In order to allow for the expected variance, some additional capacity must be provided throughout the entire range of Station Counts. Second, few, if any, institutions are so fixed in their educational programs that they will not change them in the course of time. Sufficient capacity must be allowed in the Station Count distribution to permit teaching techniques to change, for new courses to be added, or for existing courses to be revised. For example, some courses may change from only one lecture Section to several small recitation Sections, or to fewer hours of lecture and more recitation hours, or from more laboratory work to more classroom hours, or from formal class time to more independent study, and so on. All of these changes require SOR criteria which have enough breathing room that desirable educational changes are not stifled.

(g) **Station Counts**
In the final analysis two factors affect the establishment of SOR criteria. One of these is the projected distribution of Section Sizes. The other stems from an arithmetic reality. If each room has sufficient Stations to accommodate the largest Section to be scheduled in it, and then is scheduled for subsequently smaller Sections until the RUR criterion for that room is met, then most rooms cannot have an SOR of 1.00. This necessary lowering of the SOR, which results from optimizing the RUR, typically reduces the basic SOR to 0.85 as the basic starting point to which the effects of all the other elements discussed above are added. For some Station Counts, particularly the largest and sometimes the smallest, these additional considerations may lower the SOR to 0.50, or even less in specific instances.

FACTORS WHICH AFFECT THE ASSIGNABLE SQUARE FEET PER STATION

1. Although institutional characteristics do not bear a causal relationship to the size of the ASF/N ratio, certain correlations may be evident.

(a) **Size of institution**
Because a small institution is more likely to have smaller Section Sizes and therefore proportionately more rooms with smaller Station Counts, and because rooms with smaller Station Counts are likely to have more ASF/N, there is a tendency for small institutions to have larger Av(ASF/N) values.

(b) **Age of institution**
Because a new institution is likely to be small, it may show the same tendency for larger Av(ASF/N) values.

(c) **Student level**
Because Section Sizes tend to become smaller as student level becomes higher, and because class laboratory work becomes more complex and more highly specialized as student level becomes higher, institutions tend to require more ASF/N as the proportion of advanced students increases; indeed, the rate of increase for the ASF/N ratio tends to rise

as institutions have larger numbers, respectively, of advanced undergraduates, beginning graduates, advanced graduates, and postdoctoral students.

2. Three program decisions are of primary importance in setting ASF/N criteria. These program decisions are fundamental to a determination of the type of Stations that will be required.

(a) **Instructional activities**
An academic program analysis yields the basic information concerning how many of what kinds of Stations are needed to provide facility support for the academic program. Because various types of Stations (armchair desks, laboratory stools, benches, etc.) and various types of laboratories require various amounts of ASF/N, an assessment of the academic program needs is the first requirement in developing ASF/N criteria.

(b) **Noninstructional activities**
Instructional facilities sometimes serve purposes other than the scheduled meetings of formally organized classes. Therefore, the real determinant of ASF/N may be found outside the area of academic considerations. For example, a group of classrooms in a residence hall may be designed to also accommodate the cultural-recreational needs of the residence hall program. Because this may produce more space than is needed for classroom purposes, the resulting rooms may have a higher ASF/N value than would exist if the rooms had been designed only for classroom purposes. Another example might be found in a library where classrooms could also serve as study rooms during certain hours.

(c) **Facilities management**
The ASF/N value for a particular instructional room, or group of rooms, may vary from time to time as various management decisions are made. For example, it is sometimes necessary to temporarily add Stations to an existing room in order to accommodate a larger than usual Section Size or to avoid moving such a Section because only that room satisfies certain equipment needs; sometimes it is necessary to remove Stations in order to install additional equipment such as an audio/visual stand or booth; sometimes in a small, growing institution the furniture in some rooms is changed from tables and chairs to armchair desks in order to provide more Stations per room because Section Sizes are increasing. Sometimes when an additional instructional room is required, the only available room has more square feet than is required, yet the basic room configuration does not permit using the excess for other purposes. Sometimes the ASF/N which exist are purely a function of decisions made many years ago when the academic program, building design, and construction cost were vastly different. These are but a few examples of the ways in which ASF/N values may be influenced by facilities management decisions made in the context of optimizing the use of all institutional resources.

3. Several Station characteristics have the most direct impact on the determination of ASF/N criteria.

(a) **Type of Station**
Of all the factors which influence the size of the ASF/N, the type of Station is the most important. Generally, laboratory Stations require more space than classroom Stations. Within the classroom category moveable seating generally requires more space per Station than fixed seating, and table and chair type seating requires more than armchair desks. Sections 2.4. and 3.5. of Manual Two provide some suggested ASF/N criteria for classrooms by type of seating and for class laboratories by type of laboratory. Caution must be exercised in using the values suggested in those two sections. Ideally, each institution should develop its own ASF/N criteria. In that development it should depend most heavily upon its own experience when possible. Next, it might profit from the advice and counsel of other institutions with comparable programs. It might use averages or norms as rough rules of thumb, but it should never accept the advice and counsel of architects and other outside experts without critical questioning.

(b) **Station Count**
Although the generalization is far from absolute, it usually is true that, for a given type of Station, there are fewer ASF/N required in rooms with higher Station Counts. This is true because the ASF/N ratio is based upon all of the ASF in a room. Included in that space are the square feet allowed for the instructor's Station and the general circulation space within the room. Adding space for additional Stations does not require a proportional increase in instructor and circulation space. Occasionally, of course, one basic layout will require a slightly greater ASF/N than some other design for the same or slightly greater number of Stations. It is still usually true that fewer ASF/N are required as the Station Count increases within a type of Station category.

(c) **Instructor's Station**
Most instructional rooms require what is sometimes referred to as a teaching Station. Whatever it is called, this space is arbitrarily included in the ASF/N calculation for each instructional room. The amount of such space varies with the type of Station and with the basic room dimensions. In a seminar room (tables and chairs) the instructor's Station may have the same space allowance as a student Station. In a more formal classroom some space across the front of the room, usually 7 to 9 feet

deep, is allowed for an instructor's table. For a room with more Stations this basic depth tends to remain constant, although the width of the space may or may not increase depending on whether additional Stations are accommodated by widening or lengthening the room dimensions. Some class laboratories have an instructor's Station in the form of a special demonstration table or bench; others have no such space. Such a Station and its specific requirements depend upon the academic discipline and those responsible for teaching it.

(d) **Circulation space**
Like the instructor Station, the circulation space within the room is arbitrarily included in the ASF/N ratio. Two factors tend to determine the amount of circulation space in the room. Design criteria in the form of fire safety regulations, building codes, and so on set certain requirements such as minimum width of aisles, maximum number of seats per row in terms of distance to the aisles, minimum size and number of exits, etc. Another factor is the basic circulation pattern. For example, in classrooms with armchair desks the basic circulation pattern involves the amount of space required for vertical rows of seats versus horizontal rows. In laboratories it may involve single-face versus double-face benches and island versus peninsular benches. Two generalizations concerning circulation spaces are appropriate. First, design criteria which grow out of fire safety and other regulations should never be viewed as anything other than *minimal* requirements which must be met. For the most part such requirements are based on moving people in one direction under emergency conditions. However, the effective use of instructional spaces often requires more circulation area than is required by safety regulations because it is necessary to move people in and out of rooms simultaneously under normal time pressures. Second, the amount of circulation space which yields the smallest ASF/N ratio is not automatically the best. For reasons cited in connection with design criteria as well as for sound academic reasons, the circulation space must support the basic purposes for which the Stations in the room are intended.

(e) **Service space**
Practice varies as to whether the Assignable Square Feet devoted to classroom or class laboratory service space is included in the ASF/N ratio. For that reason caution should be taken in using this ratio. The amount of such service space is usually nonexistent or small for most classrooms. Typical spaces include projection booths and lecture-preparation rooms. Depending upon the academic specialty, class laboratories may require little, if any, service space or a great deal. Some class laboratories have as much or more service space as primary space.

(f) **Flexibility**
Usually, but not always, flexibility of room use increases the ASF/N required. Moveable seating usually takes more space than fixed seating. Rooms with moveable partitions require more ASF/N. A marked exception to this generalization occurs in the case of class laboratories. Generally, the more highly specialized, less flexible laboratories have a higher ASF/N ratio than general purpose and introductory laboratories.

(g) **Modular numbers**
Even though the arithmetic manipulation of program analysis data may suggest the need for a classroom of 37 Stations or a class laboratory of 31 Stations there are no compelling reasons for building rooms of precisely those Station Counts. This is not to say that such rooms could not be designed, or that rooms of those Station Counts do not exist. Rather it is to suggest that most classroom and class laboratory layouts are based on some modular arrangement. The particular modular system used depends, in part, on the range of Station Counts which must be designed into a single building and, in part, on the instructional requirements such as vertical versus horizontal seat arrangements, odd versus even numbers of rows, and so on. Although this emphasis on modular numbers may increase the actual Assignable Square Feet above the theoretical number requirement, it tends to reduce the ASF/N ratio because unused spaces for Stations do not occur.

(h) **Station layout**
Related to the problem of modular numbers is the issue of the Station configuration within a room. Within the confines of safety requirements are several considerations, not all of which are automatically considered by architects. Many academic people feel that the table for seminar seating ought to be round or at least square. If it is not square then it should be more nearly square than rectangular so that the fundamental purpose of having people face each other can be achieved. In other instances, academic people argue for an odd number of rows (horizontal or vertical) of moveable armchair desks so that in examination seating using every other row will permit more than half the seats to be used (the first and last row can be used). Occasionally, in the design of a lecture room an architect is found whose ASF/N assumptions reflect the size of yesterday's rather than today's youth. Knee space may also be a problem in class laboratories. In all of these considerations the size of the ASF/N ratio is less important than a genuine concern for the need to design Stations which will enhance the learning process.

Section 4.4.

SUMMARY

In most institutions, classrooms and class laboratories represent a small but important part of the facility resources. Increased utilization of these instructional facilities is sometimes consistent with, sometimes counterproductive to, the optimum utilization of the total institutional resources required by the educational program. Some of the factors which affect utilization rates have been discussed above. Ultimately, the effect of these and many other factors must be evaluated in the context of a study of the total institutional program management system. For many institutions this study must be undertaken in the context of "changing times." Many fundamental assumptions will need to be based on "how it ought to be" rather than on "how it is." One of the serious problems in many institutions is finding effective ways to accommodate changing student preferences in an environment characterized by time-honored faculty behavior patterns and by facilities designed for yesterday's needs. It will not be easy, and it will probably cost money to find ways of implementing the necessary changes in higher education. Perhaps if there is some understanding of the real problems, there can follow some relaxation of the incessant and excessive pressure for increased facilities utilization. Perhaps there will be an awareness that modest excesses of rooms and Stations beyond today's needs make program flexibility possible. Perhaps it will be possible for facilities planning to result from program planning and analysis instead of the utilization of facilities being made a fundamental object of educational pursuit.

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

MANUAL THREE

OFFICE AND RESEARCH FACILITIES

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Section 1.

Introduction

OFFICE AND RESEARCH FACILITIES

INTRODUCTORY COMMENTS

Manual Three of the *Higher Education Facilities Planning and Management Manuals* includes facilities evaluation and projection procedures for two kinds of space:

1. Office and Office Related Facilities
2. Research Facilities

These two rather different kinds of institutional space were grouped together for many reasons, primary among which is the fact that in some departments in some institutions research and office spaces are coextensive. Moreover, many public institutions and higher education agencies use one planning factor to project facilities requirements for the combination of office and research space.

Manual Three is formulated in much the same way as the other *Higher Education Facilities Planning and Management Manuals*. Integral to each section is an explanation of the evaluation or projection procedure (called the Discussion) which is followed by an appropriate illustration of the procedures (called the Example). Although each of the procedures is thoroughly explained and illustrated, it is not intended that they will be the "answer to a maiden's prayer" as far as institutional analysis is concerned. Office facilities as well as research facilities are unique and difficult to manage, evaluate, and project even under the most ideal of circumstances. Individual institutional differences also have an effect. Nevertheless, the procedures and techniques presented and illustrated on the following pages constitute the core of a valid process to which must be added the unique elements of the institution or agency which is using them.

Section 2.

OFFICE AND OFFICE RELATED FACILITIES

ROOM TYPES INCLUDED

Offices, studios (art, music, etc.) serving as offices, office service rooms, conference rooms, and conference service rooms

DISCUSSION

Evaluation and projection of the need for office and office related facilities are based primarily on counting numbers of persons. For the most part, the people who are counted are faculty and other staff employed by the institution. In some instances, numbers of students and certain groups of the public at large are also relevant to the office and office related facilities requirements of a college or university.

An office Station is usually assigned to each staff member who requires one. That Station, typically, is assigned for his exclusive use. Exceptions to this generalization may occur when part-time employees are in departments which operate on a shift basis. Moreover, conference rooms tend to be assigned for the exclusive use of a specific department, although some sharing may occur. For these reasons the utilization concepts applied to classrooms are wholly inappropriate for offices and office related facilities.

The provision of the proper number of offices in the right location at any point in time is one of the more difficult problems in space management. Staff members tend to be added to institutional units in small increments. However, buildings usually are not expanded by adding similarly small increments, particularly in the location where they are most needed—adjacent to the colleagues of the new staff members. A few institutions have obviated this problem by assigning faculty office space on a more or less random basis. In general, however, institutions still attempt to house the staff members of one department in close proximity to each other. The procedures and examples developed here are based on the assumption that members of the same department (or at least of the same broad program area) should be "officed" together.

The amount of office space assigned to a staff member is a function of at least four considerations:

1. **Degree of privacy.** A one-Station office usually requires more Assignable Square Feet per Station than does a multiple Station office. The difference is primarily a function of the use of the internal circulation space within the office. (Exceptions to this generalization may occur in offices with extensive record storage facilities but with relatively few occupants.)

2. **Staff level.** Most institutions provide differential office sizes based upon position. For example, the president may have a larger office than a dean who has a larger office than a departmental chairman who has a larger office than a faculty member who has a larger office than a teaching assistant. Moreover, a few institutions attempt to provide increasingly larger offices within four or five major faculty ranks (from instructor through professor). Within the clerical ranks there are different levels of Assignable Square Feet per Station, frequently showing some correlation with the space allowed the "boss."

3. **Department and function.** In some departments the *type of room* known as an office also serves as what is known in others as a nonclass laboratory. The *function* being served in both instances is usually called research. For example, a chemistry professor may be assigned both an office and a nonclass laboratory. (Although instruction and research may take place in both the office and the nonclass laboratory, there is a tendency to associate the office with instructional functions and the nonclass laboratory with research functions.) In certain departments in some institutions it is assumed that the space comparable to nonclass laboratory space is to be included in the room called an office. On this basis, office sizes for faculty members vary according to department. For example, a history professor may have a larger office than a chemistry professor because the history professor's "nonclass laboratory space" (in the form of an extensive library) is included in his office, not in a separate room. In many institutions a single number of Assignable Square Feet per FTE and faculty member is used as a standard. The "research space" required by social scientists in such institutions may be provided in other spaces such as the library or "research laboratories." Occasionally, when the provision of "nonclass" laboratory space is provided within the "office," the facility is given a special name such as a studio (in art or music).

4. **Accidents of design.** Many times it is necessary to use rooms as offices which were not originally designed for that purpose. Rooms in old residence halls are a classic example. Often such rooms are larger than required or allowed by institutional criteria for offices. If the principle of privacy is deemed to be of greater importance than amount of Assignable Square Feet per person, then, in such cases, apparent excesses of Assignable Square Feet per occupant will seem to result.

An office space design technique which is being practiced more and more frequently is "office landscaping" which is intended to provide flexible office spaces by omitting partitioning. Through the convenient placement of office furniture, room dividers, and various accessory pieces, the office landscaping technique achieves visual privacy and office space flexibility, usually, however, at the expense of acoustical privacy. This technique does not seem to require planning procedures which are different in kind from those outlined in this manual. There may be a difference in degree, however, which results from the fact that landscaped office spaces may accommodate more people comfortably than do typical partitioned offices of equal area

It should be noted that the examples in the following sections have not been summarized. The institutional planner should summarize the data from his institution in formats which most accurately display the information and coincide with the intended analyses.

Section 2.1.

Detailed Method

OFFICE AND OFFICE RELATED FACILITIES

INTRODUCTORY COMMENTS

The detailed method described and illustrated on the following pages represents a procedure recommended for use when the evaluation and projection of requirements for office and office related facilities must be determined as explicitly as possible.

Very detailed data are assumed. In some instances, institutions may need to modify the procedure because data of the required level of detail are not available. The procedure is designed to permit such modification; however, it must be recognized that the validity of the results may be affected when less specific data are used.

The evaluation of the capacity of existing office and office related facilities requires a detailed inventory of existing facilities. On the basis of the inventory data of existing office and office related facilities, the method yields estimates of the number of persons by department which existing facilities of these types assigned to each department can accommodate.

The projection of office and office related facilities requirements for a new institution requires detailed distributions of the number of persons requiring office space by department and by type work Station required. (The methodology for determining these is discussed in Manual Six.) From these program data it is possible to project the required amounts of office and office related facilities.

The projection of requirements for these facilities for an existing institution is similar to that for a new institution. However, it requires the additional input of data concerning existing office and office related facilities. The procedure results in the specifications of the required number of additional offices, Stations, and Assignable Square Feet for each department.

Section 2.1.1

Detailed Method

EVALUATION OF THE CAPACITY OF OFFICE AND OFFICE RELATED FACILITIES

DISCUSSION

DATA TO BE DETERMINED

Offices

For each department*

- ►Number of persons who can be housed in existing office facilities
- ►Adequacy of the amount of existing office service facilities

Conference Rooms

- ►Number of departments which can be served adequately by existing conference room facilities
- ►Adequacy of the amount of existing conference room services areas

PROGRAM DATA REQUIRED

Offices

For each department

- ►Number of persons (adjusted for multishift use) who require office space tabulated by
  - •Type of occupant
  - •Degree of privacy

Conference Rooms

- ►Designation of departments which require conference room space and specification of
  - •Number of conferees
  - •Degree of exclusive use

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*Not all institutions are organized on a departmental basis. Those institutions which are not organized in this way should apply these procedures in accordance with their own organizational structure.

FACILITIES DATA REQUIRED

These data on existing offices, conference rooms, and related service areas:

Offices

For each department

- ►Number of offices tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference service areas

ADDITIONAL FACILITIES DATA

Because the evaluation process involves an assessment of the capability of rooms to accommodate more Stations (or the advisability of reducing the number of stations), it would be useful to have dimensioned floor plans of each room available.

UTILIZATION ASSUMPTIONS REQUIRED

Offices

For each department

- ►Number of Assignable Square Feet per office work Station tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Assignable Square Feet per office work Station tabulated by
  - Size of department
  - Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

PROCEDURE

1. Obtain from the facilities inventory the data* on existing offices, conference rooms, and related service areas.

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*Information on type of occupant and degree of privacy very seldom if ever is gathered along with the facilities inventory. Rather, it most likely is obtainable from department chairmen or in some cases from the registrar.

Offices

For each department

- ►Number of offices tabulated by
  - •Type of occupant
  - •Degree of privacy
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference room service areas

2. Establish as a matter of institutional policy allowances of Assignable Square Feet per office work Station.

Offices

For each department

- ►Number of Assignable Square Feet per office work Station tabulated by
  - •Type of occupant
  - •Degree of privacy
- ►Number of Assignable Square Feet of office service space tabulated by
  - •Size of department
  - •Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

A detailed evaluation of the capacity of existing office space must include an examination of their adequacy to accommodate persons requiring office space. Therefore, some sort of institutional policy must be formulated to stipulate who shall be allotted how much office space and on what basis. However, these policies cannot be adhered to strictly for the reasons given in Section 2. of this manual. An accurate and reasonable evaluation of individual office spaces requires that the planner be familiar with architectural configurations of offices at his institution.

Special requirements for spaces which, typically, are classified as office service space (such as vaults, special waiting rooms, interview rooms, private toilets, and extraordinary file storage) must be considered in addition to the normal service space needs.

3. Obtain the program data concerning the number of persons who currently require office work Stations and the number of conference rooms required, and calculate the current requirements for office and office related facilities.

Offices

For each department

►Number of persons (adjusted for multishift use) who require office space tabulated by

- Type of occupant
- Degree of privacy

Conference Rooms

►Designation of departments which require conference room space and specifications of

- Number of conferees
- Degree of exclusive use

Once the program data has been obtained in the suggested format, the existing requirements for office space and conference room space can be determined on the basis of the allowances established in the preceding step.

4. Compare the existing program requirements with the available facilities for offices, conference rooms, and related service areas.

COMMENTS ON THE PROCEDURE

The procedure for evaluating the current use and capacities of office facilities depends heavily on institutional policy and administrative judgments. Two factors in particular influence the judgmental considerations:

First is the assumption that office space will be assigned in such a way as to maintain physical proximity for the staff of each department. This objective often creates a situation in which staff needs and availability of facilities are not well matched; either more space is assigned originally than is called for by institutional policy or too little space is available after a few years of operation. Office location is a matter of such importance that the evaluation must be based on conditions at the departmental rather than the institutional level.

Second, architectural considerations heavily influence the utilization of office facilities. Offices usually are provided as rooms, not as specific numbers of Assignable Square Feet. If the rooms available are larger than called for in an institution's policy statement, the evaluation must recognize the situation. The assignment process involves allocating specific rooms to specific individuals. The evaluation process calls for examination of the results of the assignment process and for making judgments within the context of existing physical plant.

One important consideration which is often neglected when plans for office space needs are being developed is the need for phantom corridor space within office suites. Allowance must be made for circulation within a group of offices. This type of assignable space in the type of situation mentioned often amounts to 8 to 12 percent of the total office space.

Section 2.1.1

Detailed Method

EVALUATION OF THE CAPACITY OF EXISTING OFFICE AND OFFICE RELATED FACILITIES

EXAMPLE

DATA TO BE DETERMINED

Offices

For each department

- ►Number of persons who can be housed in existing facilities
- ►Adequacy of the amount of existing office service facilities

Conference Rooms

- ►Number of departments which can be served adequately by existing conference room facilities
- ►Adequacy of the amount of existing conference room service facilities

PROCEDURE

1. Obtain from the facilities inventory the data on existing offices, conference rooms, and related service areas.

Offices

For each department

- ►Number of offices tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference service areas

TABLE 1

CAPACITY OF EXISTING OFFICE FACILITIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Department	Type of Occupant	Degree of Privacy	Number of Work Stations Available	Number of Offices Available	Assignable Sq. Feet per Office	Total Assignable Sq. Feet (7)=(5)x(6)
ACADEMIC						
1. **Biological Sciences Division**	Administrator	Single	1	1	128	128
	Support	Double	2	1	150	150
2. Biology Dept.	Professional	Single	4	4	110	440
		Single	1	1	119	119
3. Zoology Dept.	Professional	Single	2	2	110	220
		Single	2	2	121	242
	Graduate Asst.	Double	2	1	131	131
4. **Physical Sciences Division**	Administrator	Single	1	1	191	191
	Support	Double	2	1	131	131
5. Mathematics Dept.	Professional	Single	4	4	100	400
		Double	2	1	160	160
	Graduate Asst.	Multiple	3	1	98	98
	Support	Single	1	1	80	80
6. Chemistry Dept.	Professional	Single	2	2	120	240
		Double	2	1	204	204
		Double	2	1	223	223
	Support	Single	1	1	126	126
7. Geology Dept.	Professional	Single	2	2	95	190
		Single	1	1	143	143
8. Physics Dept.	Professional	Single	2	2	118	236
		Double	2	1	192	192
		Double	2	1	133	133
9. **Humanities Division**	Administrator	Single	1	1	154	154
	Support	Double	2	1	144	144
10. English Dept.	Professional	Single	4	4	121	484
		Single	2	2	100	200
		Double	4	2	157	314
11. Fine Arts Dept.	Professional	Single	7	7	122	854
		Double	4	2	147	294
	Support	Multiple	3	1	217	217
12. Philosophy Dept.	Professional	Single	6	6	111	666
		Single	1	1	100	100
		Double	2	1	181	181
	Support	Single	1	1	156	156
13. Classics Dept.	Professional	Single	1	1	155	155
14. **Languages Division**	Administrator	Single	1	1	144	144
	Professional	Single	6	6	144	864
		Single	3	3	112	336
	Graduate Asst.	Multiple	3	1	144	144
	Support	Double	2	1	144	144
15. **Social Sciences Division**	Administrator	Single	1	1	124	124
	Support	Double	2	1	144	144
16. Political Science Dept.	Professional	Single	6	6	102	612
		Single	1	1	95	95
		Double	2	1	180	180
17. History Dept.	Professional	Single	4	4	104	416
		Single	1	1	139	139
		Double	6	3	200	600
	Support	Single	1	1	90	90
18. Economics Dept.	Professional	Single	4	4	103	412
		Double	2	1	180	180
19. Psychology Dept.	Professional	Single	5	5	103	515
20. **Business Division**	Administrator	Single	1	1	103	103
	Professional	Single	4	4	95	380
		Double	6	3	186	558
	Support	Multiple	3	1	196	196

TABLE 1 (continued)

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Number of Work Stations Available	(5) Number of Offices Available	(6) Assignable Sq. Feet per Office	(7) Total Assignable Sq. Feet
21. **Education Division**	Administrator	Single	1	1	130	130
	Professional	Single	4	4	103	412
		Double	2	1	166	166
	Support	Double	1	1	130	130
22. **Physical Education Division**	Professional	Single	4	4	130	520
		Double	2	1	195	195
Subtotal	N/A	N/A	159	125	N/A	16,025
NONACADEMIC						
1. Office of the President	Administrator	Single	1	1	265	265
	Professional	Single	1	1	110	110
	Support	Single	1	1	120	120
2. Office of the Academic Vice-President	Administrator	Single	1	1	120	120
	Support	Single	1	1	90	90
3. Office of the Administrative Vice-President	Administrator	Single	1	1	158	158
	Professional	Single	1	1	110	110
	Support	Double	2	1	176	176
4. Office of the Financial Vice-President	Administrator	Single	1	1	154	154
	Support	Double	2	1	140	140
5. Office of the Vice-President for Student Services	Administrator	Single	1	1	140	140
	Support	Multiple	3	1	182	182
6. Office of the Dean of the Graduate School*	Support	Double	2	1	182	182
7. Admissions Office	Professional	Single	1	1	100	100
	Support	Double	2	1	170	170
8. Registrar's Office	Professional	Single	2	2	100	200
	Support	Double	2	1	187	187
9. Budget Office	Professional	Single	1	1	137	137
	Support	Single	1	1	100	100
10. Business Office	Professional	Double	2	1	178	178
	Support	Multiple	4	1	278	278
11. Purchasing Office	Professional	Single	1	1	112	112
12. Public Information Office	Professional	Single	1	1	112	112
	Support	Double	2	1	112	112
13. Publications Office	Professional	Single	1	1	112	112
14. Auxiliary Services Office	Professional	Single	4	4	131	524
	Support	Single	3	3	102	306
		Single	3	3	98	294
		Double	2	1	184	184
15. Physical Plant Office	Professional	Single	1	1	110	110
		Double	2	1	166	166
	Support	Multiple	3	1	200	200
Subtotal	N/A	N/A	56	40	N/A	5,529
TOTAL	N/A	N/A	215	165	N/A	21,554

*One person holds the joint appointment of Administrative Vice-President and Dean of the Graduate School.

TABLE 2

TABULATION OF EXISTING OFFICE SERVICE FACILITIES

(1)	(2)
Department	Assignable Square Feet of Office Service Facilities
ACADEMIC	
1. **Biological Sciences Division**	8
2. Biology Department	22
3. Zoology Department	94
4. **Physical Sciences Division**	25
5. Mathematics Department	70
6. Chemistry Department	56
7. Geology Department	40
8. Physics Department	72
9. **Humanities Division**	40
10. English Department	102
11. Fine Arts Department	98
12. Philosophy Department	86
13. Classics Department	10
14. **Languages Division**	96
15. **Social Sciences Division**	47
16. Political Science Department	100
17. History Department	106
18. Economics Department	62
19. Psychology Department	54
20. **Business Division**	108
21. **Education Division**	76
22. **Physical Education Division**	84
Subtotal	1,456
NONACADEMIC	
1. Office of the President	45
2. Office of the Academic Vice-President	16
3. Office of the Administrative Vice-President	32
4. Office of the Financial Vice-President	36
5. Office of the Vice-President for Student Services	18
6. Office of the Dean of the Graduate School	18
7. Admissions Office	110
8. Registrar's Office	88
9. Budget Office	46
10. Business Office	46
11. Purchasing Office	46
12. Public Information Office	22
13. Publications Office	82
14. Auxiliary Services Office	56
15. Physical Plant Office	66
Subtotal	727
TOTAL	2,183

TABLE 3

CAPACITY OF EXISTING CONFERENCE FACILITIES

(1) Department*	(2) Number of Conference Rooms	(3) Stations in Each Conference Room	(4) Assignable Square Feet in Each Conference Room	(5) Assignable Square Feet in Conference Room Service
ACADEMIC				
1. **Biological Sciences Division:** Biology and Zoology Departments; **Mathematics and Physical Sciences Division:** Mathematics, Chemistry, Geology, and Physics Departments	1	15	225	0
2. **Languages Division; Humanities Division:** English, Fine Arts, Philosophy, and Classics Departments	1	15	353	22
3. **Social Sciences Division:** Political Science, History, Economics, and Psychology Departments	1	20	270	30
4. **Business Division; Education Division**	1	15	360	15
5. **Physical Education Division**	1	15	340	35
Subtotal	5	N/A	1,548	102
NONACADEMIC				
6. Board of Directors Room	1	25	600	25
7. Nonacademic Departments	1	10	100	20
Subtotal	2	N/A	700	45
TOTAL	7	N/A	2,248	147

*The departmental groupings listed in Table 3 indicate the degree of shared use.

2. Establish as a matter of institutional policy allowances of Assignable Square Feet per office work Station.

Offices

For each department

- Number of Assignable Square Feet per office work Station tabulated by
  - Type of occupant
  - Degree of privacy
- Number of Assignable Square Feet of office service tabulated by
  - Size of department
  - Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

TABLE 4

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE WORK STATIONS*

(1)	(2)	(3)	(4)	(5)
	Academic Departments		Nonacademic Departments	
Personnel Category	Single Occupancy ASF/Station	Multiple Occupancy ASF/Station	Single Occupancy ASF/Station	Multiple Occupancy ASF/Station
1. Administrator				
President	N/A	N/A	300±50	N/A
Vice-Pres.	N/A	N/A	240±30	N/A
Dean	240±20	N/A	N/A	N/A
Chairman	180±20	N/A	N/A	N/A
2. Professional	120±10	90±10	120±20	90±10
3. Secretarial Clerical	120±10	90±20	120±40	90±20
4. Graduate Assistants	N/A	50±10	N/A	N/A

*The office station allowances displayed in Table 4 are illustrative only and are not recommended as standards.

TABLE 5

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE SERVICE FACILITIES FOR A NEW INSTITUTION*

(1)	(2)	(3)
Department by Size (FTE Staff Requiring Work Stations)	Assignable Square Feet of Service Space per Department*	
	Academic Departments	Nonacademic Departments
0- 5	150 ± 25	150 ± 50
6-10	200 ± 25	200 ± 50
11-20	250 ± 25	250 ± 50
21-30	300 ± 25	300 ± 50
31 and above	350 ± 25 +5 ASF per each FTE staff over 30	350 ± 50 +5 ASF per each FTE staff over 30

*The office service space criteria displayed in Table 5 are illustrative only and are not recommended as standards.

In cases where "extent of storage" is required to be unusually high, special storage areas must be added to the above normal amount of recommended office service space. This can be done on an ASF per file unit basis times the number of file units required for program activities.

TABLE 6

ASSIGNABLE SQUARE FEET CRITERIA FOR CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES*

(1)	(2)	(3)
Conference Room Assignable Square Feet per Station		Conference Room Service Space in Assignable Square Feet per Conference Room
Stations	Assignable Square Feet per Station	
10	25	30 ± 5†
15	22	30 ± 5
20	20	30 ± 5
25	20	30 ± 5
30	18	30 ± 5

*The conference room and conference room service criteria displayed in Table 6 are illustrative only and are not recommended as standards.

†Does not include chair storage.

3. Obtain the program data concerning the number of persons who currently require office work Stations and the number of conference rooms required and calculate current requirements for office and office related facilities.

Offices

For each department

►Number of persons (adjusted for multishift use) who require office space tabulated by

- Type of occupant
- Degree of privacy

Conference Rooms

►Designation of departments which require conference room space and specification of

- Number of conferees
- Degree of exclusive use

TABLE 7

EXISTING REQUIREMENTS FOR OFFICE FACILITIES

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Number of FTE People Requiring Office Space	(5) Number of Work Stations Required*	(6) Number of Offices Required	(7) Assignable Square Feet per Office Required	(8) Total Assignable Square Feet Required (8)=(6)x(7)
ACADEMIC							
1. **Biological Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Double	1.0	2[a]	1	180	180
2. Biology Department	Professional	Single	5.0	5	5	130	650
	Graduate Asst.	Multiple	1.0	3[b]	1	150	150
	Support	Double	1.0	0[a]	0	180	0
3. Zoology Department	Professional	Single	4.0	4	4	130	520
	Graduate Asst.	Multiple	1.0	0[b]	0	150	0
4. **Physical Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Double	1.0	2[c]	1	180	180
5. Mathematics Department	Professional	Single	5.0	5	5	130	650
		Double	2.0	2	1	180	180
	Graduate Asst.	Multiple	.6	3[d]	1	150	150
	Support	Single	1.0	1	1	130	130
6. Chemistry Department	Professional	Single	2.0	2	2	130	260
		Double	4.0	4	2	180	360
	Graduate Asst.	Multiple	.6	0	0	150	0
	Support	Single	1.0	1[d]	1	130	130
7. Geology Department	Professional	Single	3.0	3	3	130	390
8. Physics Department	Professional	Single	2.0	2	2	130	260
		Double	4.0	4	2	180	360
	Graduate Asst.	Multiple	.6	0[d]	0	150	0
	Support	Double	1.0	0[c]	0	180	0
9. **Humanities Division**	Administrator	Single	1.0	1	1	180	180
	Support	Double	1.0	2[e]	1	180	180
10. English Department	Professional	Single	5.0	5	5	120	600
		Double	6.0	6	3	180	540
	Support	Double	1.0	0[e]	0	180	0
11. Fine Arts Department	Professional	Single (studio)	8.0	8	8	250	1,920
		Single	3.0	3	3	180	540
	Graduate Asst.	Multiple	2.0	3[f]	1	150	150
	Support	Double	2.0	2	1	180	180
12. Philosophy Department	Professional	Single	7.0	7	7	120	840
		Double	2.0	2	1	180	180
	Support	Single	1.0	1	1	120	120
13. Classics Department	Professional	Single	1.0	1	1	120	120
14. **Languages Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	5.0	5	5	120	600
		Double	4.0	4	2	180	360
	Support	Double	2.0	2	1	180	180
15. **Social Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Double	1.0	2[g]	1	180	180
16. Political Science Department	Professional	Single	5.0	5	5	120	600
		Double	4.0	4	2	180	360
	Support	Double	1.0	0[g]	0	180	0
17. History Department	Professional	Single	5.0	5	5	120	600
		Double	6.0	6	3	180	540
	Support	Single	1.0	1	1	130	130
18. Economics Department	Professional	Single	2.0	2	2	120	240
		Double	4.0	4	2	180	360
19. Psychology Department	Professional	Single (exper.)	2.0	2	2	250	500
		Double (exper.)	1.0	2	1	300	300
		Single	3.0	3	3	120	360
		Double	2.0	2	1	180	180
	Support	Single	1.0	1	1	120	120

*One Station is allowed for each FTE staff requiring office space.

[a] Support personnel in the Biological Sciences Division and Biology Department can share an office.

[b] Graduate assistants in the Biology and Zoology Departments can share an office.

[c] Support staff in the Physical Sciences Division and Physics Department can share an office.

[d] Graduate assistants in the Mathematics, Chemistry, and Physics Departments can share an office.

[e] Support staff in the Humanities Division and the English Department can share an office.

[f] One extra Station for a graduate assistant is provided in the Fine Arts Department.

[g] Support staff in the Social Sciences Division and the Political Science Department can share an office.

TABLE 7 (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Department	Type of Occupant	Degree of Privacy	Number of FTE People Requiring Office Space	Number of Work Stations Required*	Number of Offices Required	Assignable Square Feet per Office Required	Total Assignable Square Feet Required (8)=(6)x(7)
20. **Business Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	3.0	3	3	120	360
		Double	6.0	6	3	180	540
	Support	Single	1.0	1	1	120	120
21. **Education Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	4.0	4	4	120	480
		Double	2.0	2	1	180	180
	Support	Single	1.0	1	1	120	120
22. **Physical Education Division**	Professional	Single	2.0	2	2	120	240
		Double	4.0	4	2	180	360
Subtotal	N/A	N/A	158.8	163	125	N/A	19,190
NONACADEMIC							
1. Office of the President	Administrator	Single	1.0	1	1	300	300
	Professional	Single	1.0	1	1	140	140
	Support	Single	1.0	1	1	160	160
2. Office of the Academic Vice-President	Administrator	Single	1.0	1	1	250	250
	Support	Single	2.0	2	2	160	320
3. Office of the Administrative Vice-President	Administrator	Single	1.0	1	1	250	250
	Professional	Single	1.0	1	1	140	140
	Support	Double	2.0	2	1	180	180
4. Office of the Financial Vice-President	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
5. Office of the Vice-President for Student Services	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
6. Office of the Dean of the Graduate School**	Support	Double	2.0	2	1	180	180
7. Admissions Office	Professional	Single	1.0	1	1	140	140
	Support	Single	1.0	1	1	160	160
		Double	2.0	2	1	180	180
8. Registrar's Office	Professional	Single	2.0	2	2	140	280
	Support	Single	2.0	2	2	160	320
		Double	2.0	2	1	180	180
9. Budget Office	Professional	Single	1.0	1	1	140	140
	Support	Single	1.0	1	1	160	160
10. Business Office	Professional	Double	2.0	2	1	180	180
	Support	Multiple	2.0	4[h]	1	320	320
11. Purchasing Office	Professional	Single	1.0	1	1	140	140
	Support	Multiple	2.0	0[h]	0	0	0
12. Public Information Office	Professional	Single	1.0	1	1	140	140
	Support	Double	1.0	2[i]	1	160	160
13. Publications Office	Professional	Single	1.0	1	1	140	140
	Support	Double	1.0	0[i]	0	0	0
14. Auxiliary Services Office	Professional	Single	4.0	4	4	140	560
	Support	Single	3.0	3	3	160	480
		Multiple	4.0	4	1	320	320
15. Physical Plant Office	Professional	Single	1.0	1	1	140	140
		Double	2.0	2	1	180	180
	Support	Multiple	3.0	3	1	240	240
Subtotal	N/A	N/A	58.0	58	41	N/A	7,340
TOTAL	N/A	N/A	216.8	221	166	N/A	26,530

*One Station is allowed for each FTE staff requiring office space.

**One person holds the joint appointment of Administrative Vice-President and Dean of the Graduate School.

[h] Support staff in the Business Office and Purchasing Office may share an office.

[i] Support staff in the Public Information and Publications Office may share an office.

TABLE 8

EXISTING REQUIREMENTS FOR OFFICE SERVICE FACILITIES

(1) Department	(2) Number of FTE Staff Requiring Office Work Stations	(3) Required Assignable Square Feet of Office Service Facilities
ACADEMIC		
1. **Biological Sciences Division**	2.0	140
2. Biology Department	7.0	175
Special File Collection*		130
3. Zoology Department	5.0	170
4. **Physical Sciences Division**	2.0	140
5. Mathematics Department	8.6	225
6. Chemistry Department	7.6	175
Special File Collection*		130
7. Geology Department	3.0	125
8. Physics Department	7.6	175
Special File Collection*		130
9. **Humanities Division**	2.0	140
10. English Department	12.0	225
11. Fine Arts Department	15.0	245
Special File Collection*		100
12. Philosophy Department	10.0	175
13. Classics Department	1.0	125
14. **Languages Division**	12.0	225
15. **Social Sciences Division**	2.0	145
16. Political Science Department	10.0	175
17. History Department	12.0	225
18. Economics Department	6.0	175
19. Psychology Department	9.0	175
20. **Business Division**	11.0	225
Special File Collection*		100
21. **Education Division**	8.0	175
22. **Physical Education Division**	6.0	175
Subtotal	158.8	4,520
NONACADEMIC		
1. Office of the President	3.0	160
Special File Collection*		160
2. Office of the Academic Vice-President	3.0	160
3. Office of the Administrative Vice-President	4.0	160
4. Office of the Financial Vice-President	3.0	160
5. Office of the Vice-President for Student Services	3.0	160
6. Office of the Dean of the Graduate School	2.0	160
Special File Collection*		100
7. Admissions Office	4.0	160
Special File Collection*		100
8. Registrar's Office	6.0	160
Special File Collection*		300
9. Budget Office	2.0	160
10. Business Office	4.0	160
11. Purchasing Office	3.0	160
Special File Collection*		140
12. Public Information Office	2.0	160
13. Publications Office	2.0	160
14. Auxiliary Services Office	11.0	225
15. Physical Plant Office	6.0	160
Subtotal	58.0	3,265
TOTAL	216.8	7,785

*Extent of required storage higher than normal; therefore, additional space is necessary.

TABLE 9

EXISTING REQUIREMENTS FOR CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES

(1) Department	(2) Number of Conferees*	(3) Number of Stations Required	(4) Assignable Square Feet per Station	(5) Total Assignable Square Feet Required (5)=(4)x(3)	(6) Total Conference Room Service Space Required	(7) Total Conference Room Service Space Assignable Square Feet
ACADEMIC						
1. **Biological Sciences Division:** Biology and Zoology Departments	14.0	15	22	330	30	360
2. **Physical Sciences Division:** Mathematics, Chemistry, Geology, and Physics Departments	28.8	30	18	540	35	575
3. **Humanities Division:** English, Fine Arts, Philosophy, and Classics Departments	40.0	30	18	540	35	575
4. **Languages Division**	12.0	15	22	330	30	360
5. **Social Sciences Division:** Political Science, History, Economics, and Psychology Departments	39.0	30	18	540	35	575
6. **Business Division; Education Division**	19.0	20	20	400	35	435
7. **Physical Education Division**	6.0	10	25	250	25	275
Subtotal	158.8	150	N/A	2,930	225	3,185
NONACADEMIC						
1. Board of Directors	25	25	20	500	35	535
2. Nonacademic Departments	15†	15	22	330	30	360
		15	22	330	30	360
Subtotal	40	55	N/A	1,160	95	1,255
TOTAL	198.8	205	N/A	4,090	320	4,410

*Number of conferees can be either the sum of all personnel in the departments involved or the result of a subjective judgment as is the case for the nonacademic departments.

†Two conference rooms are provided.

4. Compare the existing program requirements with the available facilities for offices, conference rooms, and related service areas.

TABLE 10

COMPARISON OF THE EXISTING REQUIREMENTS FOR OFFICE FACILITIES WITH THE CAPACITY OF EXISTING OFFICE FACILITIES

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Additional Number of Work Stations Required	(5) Additional Number of Offices Required	(6) Additional Assignable Square Feet Required
ACADEMIC					
1. **Biological Sciences Division**	Administrator	Single	0	0	52
	Support	Double	0	0	30
2. Biology Dept.	Professional	Single	0	0	91
	Graduate Asst.	Multiple	3	1	150
	Support	Double	0	0	0
3. Zoology Dept.	Professional	Single	0	0	58
	Graduate Asst.	Multiple	(—2)	(—1)	(—131)

TABLE 10 (continued)

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Additional Number of Work Stations Required	(5) Additional Number of Offices Required	(6) Additional Assignable Square Feet Required
4. **Physical Sciences Division**	Administrator	Single	0	0	(—11)
	Support	Double	0	0	49
5. Mathematics Dept.	Professional	Single	1	1	250
		Double	0	0	20
	Graduate Asst.	Multiple	0	0	52
	Support	Single	0	0	50
6. Chemistry Dept.	Professional	Single	0	0	20
		Double	0	0	(—67)
	Graduate Asst.	Multiple	0	0	0
	Support	Single	0	0	4
7. Geology Dept.	Professional	Single	0	0	57
8. Physics Dept.	Professional	Single	0	0	24
		Double	0	0	35
	Graduate Asst.	Multiple	0	0	0
	Support	Double	0	0	0
9. **Humanities Division**	Administrator	Single	0	0	26
	Support	Double	0	0	36
10. English Department	Professional	Single	(—1)	(—1)	(—84)
		Double	2	1	226
	Support	Double	0	0	0
11. Fine Arts Dept.	Professional	Single (studio)	8	8	1,920
		Single	(—4)	(—4)	(—314)
		Double	(—4)	(—2)	(—294)
	Graduate Asst.	Multiple	3	1	150
	Support	Double	(—1)	0	(—37)
12. Philosophy Dept.	Professional	Single	0	0	74
		Double	0	0	(—1)
	Support	Single	0	0	(—36)
13. Classics Dept.	Professional	Single	0	0	(—35)
14. **Languages Division**	Administrator	Single	0	0	36
	Professional	Single	(—4)	(—4)	(—600)
		Double	4	2	360
	Graduate Asst.	Multiple	(—3)	(—1)	(—144)
	Support	Double	0	0	36
15. **Social Sciences Division**	Administrator	Single	0	0	56
	Support	Double	0	0	36
16. Political Science Department	Professional	Single	(—2)	(—2)	(—107)
		Double	2	1	180
	Support	Double	0	0	0
17. History Dept.	Professional	Single	0	0	45
		Double	0	0	(—60)
	Support	Single	0	0	40
18. Economics Dept.	Professional	Single	(—2)	(—2)	(—172)
		Double	2	1	180
19. Psychology Dept.	Professional	Single (exper.)	2	2	500
		Double (exper.)	2	1	300
		Single	(—2)	(—2)	(—155)
		Double	2	1	180
	Support	Single	1	1	120
20. **Business Division**	Administrator	Single	0	0	77
	Professional	Single	(—1)	(—1)	(—20)
		Double	0	0	(—18)
	Support	Single	1	1	120
		Multiple	(—3)	(—1)	(—196)

TABLE 10 (continued)

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Additional Number of Work Stations Required	(5) Additional Number of Offices Required	(6) Additional Assignable Square Feet Required
21. **Education Division**	Administrator	Single	0	0	50
	Professional	Single	0	0	68
		Double	0	0	14
	Support	Single	0	0	(—10)
22. **Physical Education Division**	Professional	Single	(—2)	(—2)	(—280)
		Double	2	1	165
Subtotal	N/A	N/A	4	4	3,165
NONACADEMIC					
1. Office of the President	Administrator	Single	0	0	35
	Professional	Single	0	0	30
	Support	Single	0	0	40
2. Office of the Academic Vice-President	Administrator	Single	0	0	130
	Support	Single	1	1	230
3. Office of the Administrative Vice-President	Administrator	Single	0	0	92
	Professional	Single	0	0	30
	Support	Double	0	0	4
4. Office of the Financial Vice-President	Administrator	Single	0	0	96
	Support	Double	0	0	40
5. Office of the Vice-President for Student Services	Administrator	Single	0	0	110
	Support	Multiple	(—1)	0	(—2)
6. Office of the Dean of the Graduate School*	Support	Double	0	0	(—2)
7. Admissions Office	Professional	Single	0	0	40
	Support	Single	1	1	160
		Double	0	0	10
8. Registrar's Office	Professional	Single	0	0	80
	Support	Single	2	2	320
		Double	0	0	(—7)
9. Budget Office	Professional	Single	0	0	3
	Support	Single	0	0	60
10. Business Office	Professional	Double	0	0	2
	Support	Multiple	0	0	42
11. Purchasing Office	Professional	Single	0	0	28
	Support	Multiple	0	0	0
12. Public Information Office	Professional	Single	0	0	28
	Support	Double	0	0	48
13. Publications Office	Professional	Single	0	0	28
	Support	Double	0	0	0
14. Auxiliary Services Office	Professional	Single	0	0	36
	Support	Single	(—3)	(—3)	(—120)
		Double	(—2)	(—1)	(—184)
		Multiple	4	1	320
15. Physical Plant	Professional	Single	0	0	30
		Double	0	0	14
	Support	Multiple	0	0	40
Subtotal	N/A	N/A	2	1	1,811
TOTAL	N/A	N/A	6	5	4,976

*One person holds the joint appointment of Administrative Vice-President and Dean of the Graduate School.

TABLE 11

COMPARISON OF REQUIREMENTS WITH THE CAPACITY OF EXISTING OFFICE SERVICE FACILITIES

(1) Department	(2) Existing Assignable Square Feet of Office Service Facilities	(3) Required Assignable Square Feet in Office Service Facilities	(4) Additional Office Service Facilities Required (4)=(3)−(2)
ACADEMIC			
1. **Biological Sciences Division**	8	140	132
2. Biology Department	22	305	203
3. Zoology Department	94	170	76
4. **Physical Sciences Division**	25	140	115
5. Mathematics Department	70	225	155
6. Chemistry Department	56	305	249
7. Geology Department	40	125	85
8. Physics Department	72	305	233
9. **Humanities Division**	40	140	160
10. English Department	102	225	123
11. Fine Arts Department	98	345	247
12. Philosophy Department	86	175	89
13. Classics Department	10	125	115
14. **Languages Division**	96	225	129
15. **Social Sciences Division**	47	145	98
16. Political Science Department	100	175	75
17. History Department	106	225	119
18. Economics Department	62	175	113
19. Psychology Department	54	175	121
20. **Business Division**	108	325	217
21. **Education Division**	76	175	99
22. **Physical Education Division**	84	175	91
Subtotal	1,456	4,520	3,064
NONACADEMIC			
1. Office of the President	45	320	275
2. Office of the Academic Vice-President	16	160	144
3. Office of the Administrative Vice-President	32	160	128
4. Office of the Financial Vice-President	36	160	124
5. Office of the Vice-President for Student Services	18	160	142
6. Office of the Dean of the Graduate School	18	260	242
7. Admissions Office	110	260	250
8. Registrar's Office	88	460	372
9. Budget Office	46	160	114
10. Business Office	46	160	114
11. Purchasing Office	46	300	254
12. Public Information Office	22	160	138
13. Publications Office	82	225	143
14. Auxiliary Services Office	56	160	104
15. Physical Plant Office	66	225	159
Subtotal	727	3,265	2,538
TOTAL	2,183	7,785	5,602

TABLE 12

COMPARISON OF REQUIREMENTS WITH THE CAPACITY OF EXISTING CONFERENCE FACILITIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Conference Room			Conference Room Service		
Department	Assignable Square Feet Available	Assignable Square Feet Required	Difference (4)=(3)—(2)	Assignable Square Feet Available	Assignable Square Feet Required	Difference (7)=(6)—(5)
ACADEMIC						
1. **Biological Sciences Division:** Biology and Zoology Departments	225	330	105	0	30	30
2. **Physical Sciences Division:** Mathematics, Chemistry, Geology, and Physics Departments	0*	540	540	0*	35	35
3. **Language Division**	353	330	(—23)	22	30	8
4. **Humanities Division:** English, Fine Arts, Philosophy, and Classics Departments	0†	540	540	0†	35	35
5. **Social Sciences Division:** Political Science, History, Economics, and Psychology Departments	270	540	270	30	35	5
6. **Business Division; Education Division**	360	400	40	15	35	20
7. **Physical Education Division**	340	250	(—90)	35	25	—10
Subtotal	1,548	2,930	1,382	102	225	123
NONACADEMIC						
1. Board of Directors	600	500	(—100)	25	35	10
2. Nonacademic Departments	100	330	230	20	30	10
		330	330	0	30	30
Subtotal	700	1,160	460	45	95	50
TOTAL	2,248	4,090	1,842	147	320	173

*Currently share conference facilities with Biological Sciences Division.
†Currently share conference facilities with Languages Division.

Section 2.1.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

Offices

For each department*

- Number of offices
- Number of Stations in each office
- Number of Assignable Square Feet in each office
- Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- Number of conference rooms
- Number of Stations in each conference room
- Number of Assignable Square Feet in each conference room
- Number of Assignable Square Feet in conference room service areas

PROGRAM DATA REQUIRED

Offices

For each department

- Number of persons (adjusted for mutishift use) who require office space tabulated by
  - Type of occupant
  - Degree of privacy

Conference Rooms

- Designation of departments which require conference room space and specification of
  - Number of conferees
  - Degree of exclusive use

FACILITIES DATA REQUIRED

- None

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*Not all institutions are organized on a departmental basis. Those institutions which are not organized in this way should apply these procedures in accordance with their own organizational structure.

UTILIZATION ASSUMPTIONS REQUIRED

Offices

For each department

- ►Number of Assignable Square Feet per office work Station tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Assignable Square Feet of office service space tabulated by
  - Size of department
  - Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

PROCEDURE

1. Obtain from the Program Planning procedures (see Manual Six) the program data for offices, conference rooms, and their related spaces for the target planning year.

Offices

For each department

- ►Number of persons (adjusted for multishift use) who require office space tabulated by
  - Type of occupant
  - Degree of privacy

Conference Rooms

- ►Designation of departments which require conference room space and specification of
  - Number of conferees
  - Degree of exclusive use

2. Establish as a matter of institutional policy allowances of Assignable Square Feet per office work Station.

Offices

For each department

- ►Number of Assignable Square Feet per office work Station tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Assignable Square Feet per office work Station tabulated by
  - Size of department
  - Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

A detailed projection of office space requirements must be based upon the formulation of institutional policy to determine who shall be allotted how much office space and on what basis. The question of who shall receive office quarters is a very sensitive issue. Often the office work stations are allotted on the basis of one for each full-time equivalent person requiring office space. However, it is not uncommon to find this determination based also on head count persons requiring office space.

Policies concerning allowances of Assignable Square Feet per office Station should not be adhered to strictly for the reasons cited in Section 2. of this manual. An accurate and reasonable projection of individual office spaces requires the planner to be familiar with architectural configurations of offices at his institution as well as aware of individual needs.

Special requirements for spaces which, typically, are classified as office service space (such as vaults, special waiting rooms, interview rooms, private toilets, and extraordinary file storage) must be considered in addition to normal service space needs.

3. Calculate the office, conference room, and related space requirements.

Offices

For each department

- ►Number of offices by department
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference room service areas

COMMENTS ON THE PROCEDURE

Offices

The number of people who require office space is the required statistic. In many institutions, that number is not readily available. The traditional institutional records which contain information on a number of persons (such as payroll or personnel office files) usually do not carry any indication concerning office requirements. Therefore, it is necessary to develop from a variety of sources the number of persons who require office space. This is a statistic peculiar to the determination of physical facility requirements and not easily derived from other staff data in an institutional management information system.

Moreover, it is also necessary to identify the persons who require office space, at least by department, because in some instances the data concerning offices must be aggregated with other facilities data.

For example, faculty in art and music departments typically are allowed extra creative activities space within their offices for easels and musical instruments. In other instances, proration of the office space to two or more functional categories may be necessary. The room type facility which is called "office" often may be serving two different institutional purposes—instruction and research, for example. In some instances art faculty may prefer to have small offices and maintain a separate studio.

It is also necessary to identify the persons who require office space by the type of occupant. These data typically are inferred with titles (and departmental assignments) associated with the persons who require office space. For example, the amount of office space to be provided may be different for staff of faculty rank than for teaching assistants; an executive secretary may require more space than a clerk in a clerical pool.

The degree of privacy required is another characteristic of office requirements determined for persons requiring office space. This information is necessary for two reasons. First, the amount of space per person usually is less in a multiple-person office than in a private office. Second, in existing institutions instances occur where faculty (or other staff) are housed in offices larger in area than would result from the normal application of institutional office-space criteria. Such situations result from a complex set of interacting factors such as historical accident, old buildings, "departmental integrity,"* unavailability of other offices of appropriate size, and so on. In the final analysis, however, they occur because the principle of privacy for the person housed in such an oversized office is considered to be more important than the square feet per person typically assumed for staff members of that particular category.

In most instances an office Station is assigned to one person. Some institutional operations, however, are on a shift basis so that one office Station can serve more than one person requiring office space. Certain offices in the library and many offices in plant maintenance and protection are typical examples.

Where this occurs the number of office Stations is not equal to the number of people requiring office space, but some lesser number, depending on the degree of "multishift" use of the same office Station.

Conference Rooms

The designation of departments which require conference room space may or may not be stated explicitly as part of the program data which is available. If it is not indicated explicitly, then some working guidelines must be developed. Usually, it is assumed that each organizational unit should have access to at least one conference room.

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*"Departmental integrity" is used here to mean the practice of housing the staff members in one department in reasonably close proximity to each other.

The number of Stations in a conference room relates directly to the number of persons it is designed to serve. For example, a conference room designed for the Biology Department normally has Stations equal to or slightly greater than the number of staff in that department. In other instances, particularly for conference rooms at the administrative level, the number of Stations is based upon the number of staff who are members of the committees which the conference room will serve. Other conference rooms (sometimes classified under other room types) used for continuing education programs, public service, or extension conferences are considered as special cases. The number of Stations in such conference rooms is a function of the conferences attracted by the educational program rather than of the staff responsible for the program.

The degree of exclusive use of conference rooms is a matter of institutional decision. It is not unusual for each academic department to have its own conference room. On the other hand, with a minimum of scheduling effort but some occasional conflicts of interest, it is possible for one conference room to serve two or more organizational units.

In some cases, it may be desirable to vary the Station allowance for conference room seating by departments. Although the practice is atypical, it does occur, nevertheless, at some institutions.

Section 2.1.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

Offices

For each department

- ►Number of offices
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference room service areas

PROCEDURE

1. Obtain from the Program Planning procedures (see Manual Six) the program data for offices, conference rooms, and their related spaces for the target planning year.

Offices

For each department

- ►Number of persons (adjusted for multishift use) who require office space tabulated by
  - Type of occupant
  - Degree of privacy

Conference Rooms

- ►Designation of departments which require conference room space and specification of
  - Number of conferees
  - Degree of exclusive use

TABLE 13
NUMBER OF FULL-TIME EQUIVALENT PERSONNEL REQUIRING OFFICE SPACE FOR A NEW INSTITUTION

(1)	(2)	(3)	(4)
Department	Type of Occupant	Degree of Privacy	Number of FTE Personnel Requiring Office Space
ACADEMIC			
1. **Biological Sciences Division**	Administrator	Single	1.0
	Support	Single	1.0
2. Biology Department*	Professional	Single	5.0
		Double	2.0
	Graduate Asst.	Multiple	1.0
	Support	Double	2.0
3. Zoology Department	Professional	Single	2.0
		Double	2.5
	Graduate Asst.	Multiple	1.0
	Support	Double	1.0
4. **Physical Sciences Division**	Administrator	Single	1.0
	Support	Single	1.0
5. Mathematics Department	Professional	Single	5.0
		Double	4.5
	Graduate Asst.	Multiple	1.0
	Support	Double	1.5
6. Chemistry Department	Professional	Single	2.0
		Double	4.5
	Graduate Asst.	Multiple	2.0
	Support	Double	2.0
7. Geology Department	Professional	Single	2.0
		Double	2.5
	Graduate Asst.	Multiple	1.0
	Support	Double	2.0
8. Physics Department	Professional	Single	3.0
		Double	4.0
	Graduate Asst.	Multiple	2.0
	Support	Single	1.0
		Double	2.0
9. **Humanities Division**	Administrator	Single	1.0
	Support	Single	1.0
10. English Department	Professional	Single	6.0
		Double	8.5
	Support	Multiple	2.0
11. Fine Arts Department	Professional	Single (studio)	8.0
		Double	2.0
	Graduate Asst.	Double (studio)	4.0
	Support	Double	2.0
12. Philosophy Department	Professional	Single	7.0
		Double	5.0
	Support	Double	2.0
13. Classics Department	Professional	Single	1.0
		Double	1.0
	Support	Multiple	0.5
14. **Languages Division**	Administrator	Single	1.0
	Professional	Single	6.0
		Double	6.0
	Graduate Asst.	Multiple	2.0
	Support	Single	1.0
		Double	1.5
15. **Social Sciences Division**	Administrator	Single	1.0
	Support	Single	1.0
16. Political Science Department	Professional	Single	5.0
		Double	6.5
	Support	Double	1.5
17. History Department	Professional	Single	6.0
		Double	7.5
	Graduate Asst.	Multiple	1.0
	Support	Double	2.0
18. Economics Department	Professional	Single	4.0
		Double	4.0
	Support	Double	1.0

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*There are no department chairmen. Since the institution is small, the organizational structure is at the division level.

TABLE 13 (continued)

(1)	(2)	(3)	(4)
Department	Type of Occupant	Degree of Privacy	Number of FTE Personnel Requiring Office Space
19. Psychology Department	Professional	Single	2.0
		Single (experimental)	2.0
		Double	4.5
	Support	Double	1.0
20. **Business Division**	Administrator	Single	1.0
	Professional	Single	5.0
		Double	6.0
	Support	Double	2.0
21. **Education Division**	Administrator	Single	1.0
	Professional	Single	3.0
		Double	4.0
	Support	Double	1.5
22. **Physical Education Division**	Administrator	Single	1.0
	Professional	Single	3.0
		Double	6.0
	Support	Double	2.0
Subtotal	N/A	N/A	216.5
NONACADEMIC			
1. Office of the President	Administrator	Single	1.0
	Professional	Single	1.0
	Support	Single	2.0
2. Office of the Academic Vice-President	Administrator	Single	1.0
	Support	Double	2.0
3. Office of the Administrative Vice-President	Administrator	Single	1.0
	Support	Double	2.0
4. Office of the Financial Vice-President	Administrator	Single	1.0
	Professional	Single	1.0
	Support	Single	1.0
5. Office of the Vice-President for Student Services	Administrator	Single	1.0
	Support	Double	2.0
6. Office of the Dean of the Graduate School	Administrator	Single	1.0
	Support	Double	2.0
7. Admissions Office	Professional	Single	2.0
	Support	Single	1.0
		Double	2.0
8. Registrar's Office	Professional	Single	2.0
	Support	Single	1.0
		Multiple	3.0
9. Budget Office	Professional	Single	2.0
	Support	Double	2.0
10. Business Office	Professional	Single	2.0
	Support	Multiple	2.5
11. Purchasing Office	Professional	Single	1.0
	Support	Multiple	2.5
12. Public Information Office	Professional	Double	2.0
	Support	Double	1.0
13. Publications Office	Professional	Single	1.0
	Support	Double	1.0
14. Auxiliary Services Office	Professional	Single	1.0
		Double	4.0
	Support	Single	1.0
		Multiple	8.0
15. Physical Plant Office	Administrator	Single	1.0
	Professional	Double	2.0
	Support	Double	4.0
Subtotal	N/A	N/A	68.0
TOTAL	N/A	N/A	284.5

TABLE 14
REQUIREMENTS FOR CONFERENCE SPACE FOR A NEW INSTITUTION

(1) Department*	(2) Total FTE In Depts.	(3) FTE Size of Largest Dept.	(4) Stations Required
ACADEMIC			
1. **Biological Sciences Division:** Biology and Zoology Departments	18.5	10.0	15
2. **Physical Sciences Division:** Mathematics and Chemistry Departments	24.5	12.0	15
3. Geology and Physics Departments	19.5	12.0	15
4. **Humanities Division:** English and Classics Departments	21.0	16.5	15
5. Fine Arts and Philosophy Departments	30.0	16.0	15
6. **Languages Division**	17.5	17.5	15
7. **Social Sciences Division:** Political Science and History Departments	31.5	16.5	20
8. Economics and Psychology Departments	18.5	9.5	10
9. **Business Division; Education Division**	23.5	14.0	15
10. **Physical Education Division**	12.0	12.0	10
Subtotal	216.5	N/A	145
NONACADEMIC			
1. Board of Directors	N/A	N/A	25
2. Nonacademic Departments	68	14	15 15
Subtotal	68	N/A	55
TOTAL	284.5	N/A	200

*The manner in which the departments are grouped indicates the "degree of exclusive use."

2. Establish as a matter of institutional policy allowances of Assignable Square Feet per office work Station.

Offices

For each department

►Number of Assignable Square Feet per office work Station tabulated by

- Type of occupant
- Degree of privacy

►Number of Assignable Square Feet of office service area tabulated by

- Size of department
- Extent of (record/office-supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

TABLE 15

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE WORK STATIONS* FOR A NEW INSTITUTION

(1)		(2)	(3)	(4)	(5)
		Academic Departments		Nonacademic Departments	
Type of Occupant		Single Occupancy ASF/Station	Multiple Occupancy ASF/Station	Single Occupancy ASF/Station	Multiple Occupancy ASF/Station
1. Administrator —	President	N/A	N/A	300 ± 50	N/A
	Vice Pres.	N/A	N/A	240 ± 30	N/A
	Dean	240 ± 20	N/A	N/A	N/A
	Chairman	180 ± 20	N/A	N/A	N/A
2. Professional		120 ± 10	90 ± 10	120 ± 20	90 ± 10
3. Secretarial-Clerical		120 ± 10	90 ± 20	120 ± 40	90 ± 20
4. Graduate Assistants		N/A	50 ± 10	N/A	N/A

*The office work Station allowances displayed in Table 15 are illustrative only and are not recommended as standards.

TABLE 16

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE SERVICE FACILITIES FOR A NEW INSTITUTION*

(1)	(2)	(3)
	Assignable Square Feet of Service Space per Department*	
Department by Size (FTE Staff Requiring Office Work Stations)	Academic Depts.	Nonacademic Depts.
0 — 5	150 ± 25	150 ± 50
6 — 10	200 ± 25	200 ± 50
11 — 20	250 ± 25	250 ± 50
21 — 30	300 ± 25	300 ± 50
31 and above	350 ± 25 +5 ASF per each FTE Staff over 30	350 ± 50 +5 ASF per each FTE Staff over 30

*The office service space criteria displayed in Table 16 are illustrative only and are not recommended as standards.

In cases where "extent of storage" is required to be unusually high, special storage areas must be added to the above normal amount of recommended office service space. This can be done on an ASF per file unit basis times the number of file units required for program activities.

TABLE 17

ASSIGNABLE SQUARE FEET CRITERIA FOR CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES IN A NEW INSTITUTION*

(1)	(2)	(3)
Conference Room Assignable Square Feet per Station		Conference Room Service Space in Assignable Square Feet per Conference Room
Stations	Assignable Square Feet Per Station	
10	25	30 ± 5**
15	22	30 ± 5
20	20	30 ± 5
25	20	30 ± 5
30	18	30 ± 5

*The conference room and conference room service assignable square feet displayed in Table 17 are illustrative only and are not recommended as standards.

**Does not include chair storage.

3. Calculate the office, conference room, and related space requirements.

Offices

For each department

►Number of offices
►Number of Stations in each office
►Number of Assignable Square Feet in each office
►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

►Number of conference rooms
►Number of Stations in each conference room
►Number of Assignable Square Feet in each conference room
►Number of Assignable Square Feet in conference room service areas

TABLE 18

REQUIREMENTS FOR OFFICE FACILITIES FOR A NEW INSTITUTION

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Department	Type of Occupant	Degree of Privacy	Number of FTE Personnel Requiring Office Space	Number of Work Stations Required[a]	Number of Offices Required	Assignable Square Feet per Office Required	Total Assignable Square Feet Required (8)=(6)x(7)
ACADEMIC							
1. **Biological Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	130	130
2. Biology Department	Professional	Single	5.0	5	5	130	650
		Double	2.0	2	1	180	180
	Graduate Asst.	Multiple	1.0	3[b]	1	150	150
	Support	Double	2.0	2	1	180	180
3. Zoology Department	Professional	Single	2.0	2	2	130	260
		Double	2.5	3	2	180	360
	Graduate Asst.	Multiple	1.0	0[b]	0	150	0
	Support	Double	1.0	2	1	180	180
4. **Physical Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	130	130
5. Mathematics Department	Professional	Single	5.0	5	5	130	650
		Double	4.5	5	3	180	540
	Graduate Asst.	Multiple	1.0	0[b]	0	150	0
	Support	Double	1.5	2	1	180	180
6. Chemistry Department	Professional	Single	2.0	2	2	130	260
		Double	4.5	5	3	180	540
	Graduate Asst.	Multiple	2.0	3[c]	1	150	150
	Support	Double	2.0	2	1	180	180
7. Geology Department	Professional	Single	2.0	2	2	130	260
		Double	2.5	3	1	180	180
	Graduate Asst.	Multiple	1.0	0[c]	0	150	0
	Support	Double	2.0	2	1	180	180
8. Physics Department	Professional	Single	3.0	3	3	130	390
		Double	4.0	4	2	180	360
	Graduate Asst.	Multiple	2.0	3[d]	1	150	150
	Support	Single	1.0	1	1	130	130
		Double	2.0	2	1	180	180
9. **Humanities Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	130	130
10. English Department	Professional	Single	6.0	6	6	130	780
		Double	8.5	9	5	180	900
	Support	Multiple	2.0	2	1	180	180
11. Fine Arts Department	Professional	Single (studio)	8.0	8	8	240	1,920
		Double	2.0	2	1	180	180
	Graduate Asst.	Double (studio)	4.0	4	2	200*	400
	Support	Single	2.0	2	2	120	240
12. Philosophy Department	Professional	Single	7.0	7	7	130	910
		Double	5.0	5	3	180	540
	Support	Double	2.0	2	1	180	180
13. Classics Department	Professional	Single	1.0	1	1	120	120
		Double	1.0	1	1	180	180
	Support	Multiple	0.5	0[e]	0[e]	90	0
14. **Languages Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	6.0	6	6	120	720
		Double	6.0	6	3	180	540
	Graduate Asst.	Multiple	2.0	3[f]	1	150	150
	Support	Single	1.0	1	1	120	120
		Double	1.5	2[e]	1	180	180
15. **Social Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	120	120
16. Political Science Department	Professional	Single	5.0	5	5	120	600
		Double	6.5	7	4	180	720
	Support	Double	1.5	2	1	180	180
17. History Department	Professional	Single	6.0	6	6	120	720
		Double	7.5	8	4	180	720
	Graduate Asst.	Multiple	1.0	0[f]	0	150	0
	Support	Double	2.0	2	1	180	180

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*Additional space is provided in these offices for "scholarly activities."

a. Office Stations are allowed generally on the basis of one Station for each FTE staff requiring office space.

b. Graduate assistants in the Departments of Biology, Zoology, and Mathematics will share an office.

c. Graduate assistants in the Departments of Chemistry and Geology will share an office.

d. One extra Station for a graduate assistant will be provided in this office.

e. Support staff in the Classics Department and Languages Division will share an office.

f. Graduate assistants in the Languages Division and History Department will share an office.

TABLE 18 (continued)

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Number of FTE Personnel Requiring Office Space	(5) Number of Work Stations Required	(6) Number of Offices Required	(7) Assignable Square Feet per Office Required	(8) Total Assignable Square Feet Required
18. Economics Department	Professional	Single	4.0	4	4	120	480
		Double	4.0	4	2	180	360
	Support	Double	1.0	1	1	180	180
19. Psychology Department	Professional	Single	2.0	2	2	120	240
		Single[g] (experimental)	2.0	2	2	240	480
		Double	4.5	5	3	180	540
	Support	Double	1.0	1	0	180	0
20. **Business Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	5.0	5	5	120	600
		Double	6.0	6	3	180	540
	Support	Double	2.0	2	1	180	180
21. **Education Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	3.0	3	3	120	360
		Double	4.0	4	2	180	360
	Support	Double	1.5	2	1	180	180
22. **Physical Education Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	3.0	3	3	120	360
		Double	6.0	6	3	180	540
	Support	Double	2.0	2	1	180	180
Subtotal	N/A	N/A	216.5	224	160	N/A	25,180
NONACADEMIC							
1. Office of the President	Administrator	Single	1.0	1	1	300	300
	Professional	Single	1.0	1	1	140	140
	Support	Single	2.0	2	2	160	320
2. Office of the Academic Vice-President	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
3. Office of the Administrative Vice-President	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
4. Office of the Financial Vice-President	Administrator	Single	1.0	1	1	250	250
	Professional	Single	1.0	1	1	140	140
	Support	Single	1.0	1	1	160	160
5. Office of the Vice-President for Student Services	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
6. Office of the Dean of the Graduate School	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
7. Admissions Office	Professional	Single	2.0	2	2	140	280
	Support	Single	1.0	1	1	160	160
		Double	2.0	2	1	180	180
8. Registrar's Office	Professional	Single	2.0	2	2	140	280
	Support	Single	1.0	1	1	160	160
		Multiple	3.0	3	1	270	270
9. Budget Office	Professional	Single	2.0	2	2	140	280
	Support	Double	2.0	2	1	180	180
10. Business Office	Professional	Single	2.0	2	2	140	280
	Support	Multiple	2.5	3	1	270	270
11. Purchasing Office	Professional	Single	1.0	1	1	140	140
	Support	Multiple	2.5	3	1	270	270
12. Public Information Office	Professional	Double	2.0	2	1	180	180
	Support	Double	1.0	1	7	180	180
13. Publications Office	Professional	Single	1.0	1	1	140	140
	Support	Double	1.0	1	7	180	0
14. Auxiliary Services Office	Professional	Single	1.0	1	1	140	140
		Double	4.0	4	2	180	360
	Support	Single	1.0	1	1	160	160
		Multiple	8.0	8	2	360	360
15. Physical Plant Office	Administrator	Single	1.0	1	1	250	250
	Professional	Double	2.0	2	1	180	180
	Support	Double	4.0	4	2	180	360
Subtotal	N/A	N/A	68.0	69	44	N/A	8,090
TOTAL	N/A	N/A	284.5	293	204	N/A	33,270

g. Offices containing research space have been provided for two professionals in the Psychology Department.

TABLE 19

REQUIREMENTS FOR OFFICE SERVICE SPACE FOR A NEW INSTITUTION

(1) Department	(2) Number of FTE Staff Requiring Office Work Stations	(3) Required Assignable Square Feet of Office Service Facilities
ACADEMIC		
1. **Biological Sciences Division**	2.0	140
2. Biology Department	10.0	225
3. Zoology Department	6.5	180
4. **Physical Sciences Division**	2.0	140
5. Mathematics Department	12.0	245
6. Chemistry Department	10.5	245
7. Geology Department	7.5	180
8. Physics Department	12.0	245
9. **Humanities Division**	2.0	125
10. English Department	16.5	225
11. Fine Arts Department	16.0	225
12. Philosophy Department	14.0	225
13. Classics Department	2.5	125
14. **Languages Division**	17.5	275
15. **Social Sciences Division**	2.0	125
16. Political Science Department	13.0	225
17. History Department	16.5	225
18. Economics Department	9.0	175
19. Psychology Department	9.5	175
20. **Business Division**	14.0	225
21. **Education Division**	9.5	175
22. **Physical Education**	12.0	175
Subtotal	216.5	4,300
NONACADEMIC		
1. Office of the President	4.0	300
2. Office of the Academic Vice-President	3.0	160
3. Office of the Administrative Vice-President	3.0	160
4. Office of the Financial Vice-President	3.0	160
5. Office of the Vice-President for Student Services	3.0	160
6. Office of the Dean of the Graduate School	3.0	160
7. Admissions Office	5.0	260
8. Registrar's Office	6.0	460
9. Budget Office	4.0	160
10. Business Office	4.5	160
11. Purchasing Office	3.5	300
12. Public Information Office	3.0	166
13. Publications Office	2.0	160
14. Auxiliary Services Office	14.0	220
15. Physical Plant Office	7.0	160
Subtotal	68.0	3,140
TOTAL	284.5	7,440

TABLE 20

REQUIREMENTS FOR CONFERENCE ROOMS AND CONFERENCE ROOM FACILITIES FOR A NEW INSTITUTION

(1)	(2)	(3)	(4)	(5)	(6)
Departments	Stations Required	ASF/Station Factor	Conference Room ASF (4)=(3)x(2)	Conference Service Factor ASF	Conference Service ASF (6)=(4)x(5)
ACADEMIC					
1. **Biological Sciences Division:** Biology and Zoology Departments	15	22	330	30 ± 5	30
2. **Physical Sciences Division:** Mathematics and Chemistry Departments	15	22	330	30 ± 5	30
3. Geology and Physics Departments	15	22	330	30 ± 5	30
4. **Humanities Division:** English and Classics Departments	15	22	330	30 ± 5	30
5. Fine Arts and Philosophy Departments	25	20	500	30 ± 5	35
6. **Languages Division**	15	22	330	30 ± 5	30
7. **Social Sciences Division:** Political Science and History Departments	20	20	400	30 ± 5	35
8. Economics and Sociology Departments	10	25	250	30 ± 5	25
9. **Business Division; Education Division**	15	22	330	30 ± 5	30
10. **Physical Education Division**	10	25	250	30 ± 5	25
Subtotal	155	N/A	3,380	N/A	300
NONACADEMIC					
1. Board of Directors	25	20	400	30 ± 5	35
2. Nonacademic	15	22	330	30 ± 5	30
Departments	15	22	330	30 ± 5	30
Subtotal	55	N/A	1,060	N/A	95
TOTAL	210	N/A	4,440	N/A	395

Section 2.1.3

Detailed Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

Offices

For each department*

- ►Number of additional offices
- ►Number of additional Stations in offices
- ►Number of additional Assignable Square Feet in offices
- ►Number of additional Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of additional conference rooms
- ►Number of additional Stations in conference rooms
- ►Number of additional Assignable Square Feet in conference rooms
- ►Number of additional Assignable Square Feet in conference room service areas

PROGRAM DATA REQUIRED

Offices

For each department

- ►Number of persons (adjusted for multishift use) who require office space distributed by
  - Type of occupant
  - Degree of privacy

Conference Rooms

- ►Designation of departments which require conference room space and specification of
  - Number of conferees
  - Degree of exclusive use

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*Not all institutions are organized on a departmental basis. Those institutions which are not organized in this way should apply these procedures in accordance with their own organizational structure.

FACILITIES DATA REQUIRED

These data on offices, conference rooms, and related service areas:

Offices

For each department

- ►Number of offices tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference service areas

UTILIZATION ASSUMPTIONS REQUIRED

Offices

For each department

- ►Number of Assignable Square Feet per office work Station tabulated by
  - Type of occupant
  - Degree of privacy
- ►Number of Assignable Square Feet of office service space tabulated by
  - Size of department
  - Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

PROCEDURE

1. Obtain from the Program Planning Procedures (see Manual Six) the program data for offices, conference rooms, and their related spaces for the target planning year.

Offices

For each department

- ►Number of persons (adjusted for multishift use) who require office space tabulated by
  - Type of occupant
  - Degree of privacy

Conference Rooms

► Designation of departments which require conference room space and specification of

- Number of conferees
- Degree of exclusive use

2. Establish as a matter of institutional policy allowances of Assignable Square Feet per office work Station.

Offices

For each department

► Number of Assignable Square Feet per office work Station tabulated by

- Type of occupant
- Degree of privacy

► Number of Assignable Square Feet of office service space tabulated by

- Size of department
- Extent of (record/office supply) storage

Conference Rooms

► Number of Assignable Square Feet per conference room Station tabulated by department
► Ad hoc determinations of conference room service area
► Degree of shared use of conference room by two or more departments

A detailed projection of office space requirements must be based upon the formulation of institutional policy to determine who shall be allotted how much office space and on what basis. The question of who shall receive office quarters is a very sensitive issue. Often the office work Stations are allotted on the basis of one for each full-time equivalent person requiring office space. However, it is not uncommon to find this determination based also on head count persons requiring office space.

Policies concerning allowances of Assignable Square Feet for office Stations should not be adhered to strictly for the reasons cited in Section 2. of this manual. An accurate and reasonable projection of individual office spaces requires the planner to be familiar with architectural configurations of offices at his institution as well as aware of individual needs.

Special requirements for spaces which typically are classified as office service space (such as vaults, special waiting rooms, interview rooms, private toilets, and extraordinary file storage) must be considered in addition to normal service space needs.

3. Calculate the office, conference room, and related space requirements.

Offices

For each department

► Number of offices
► Number of Stations in each office
► Number of Assignable Square Feet in each office
► Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference room service areas

4. Obtain from the facilities inventory these data* on existing offices, conference rooms, and related service areas.

Offices

For each department

- ►Number of offices tabulated by
    - Type of occupant
    - Degree of privacy
- ►Number of Stations in each office
- ►Number of Assignable Square Feet in each office
- ►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference room service areas

5. Compare the facilities inventory and assignment of existing office and office related space with the projected requirements.

Offices

For each department

- ►Number of additional offices
- ►Number of additional Stations in offices
- ►Number of additional Assignable Square Feet in offices
- ►Number of additional Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of additional conference rooms
- ►Number of additional Stations in conference rooms
- ►Number of additional Assignable Square Feet in conference rooms
- ►Number of additional Assignable Square Feet in conference room service areas

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*Information on type of occupant and degree of privacy very seldom, if ever, is gathered along with the facilities inventory. Rather, it is most likely to be obtainable from department chairmen or, in some cases, from the registrar.

Because this step is the most involved and time-consuming step in the procedure, it can only be outlined in these manuals. To determine additional needs requires that all of the problems of office reassignment be confronted including reshuffling of departments and personnel in the existing space and reallocating departments and personnel in the new space to be constructed. This procedure outlines the steps involved in determining absolute needs for office facilities including new offices for new personnel, inadequate existing office space, as well as excessive office facilities. The problem of reassignment is one which must be solved at each individual institution. In fact, it is primarily because of the distinctiveness of each institution's facilities that the space management problem cannot be discussed in these manuals. It must be emphasized once again that the planner's knowledge of his institution cannot be too great.

COMMENTS ON THE PROCEDURE

Offices

The number of people who require office space is the required statistic. In many institutions, that number is not readily available. The traditional institutional records which contain information on a number of persons (such as payroll or personnel office files) usually do not carry any indication concerning office requirements. Therefore, it is necessary to develop from a variety of sources the number of persons who require office space. This is a statistic peculiar to the determination of physical facility requirements and not easily derived from other staff data in an institutional management information system.

Moreover, it is also necessary to identify the persons who require office space at least by department because in some instances the data concerning offices must be aggregated with other facilities data.

For example, faculty in art departments and music departments typically are allowed extra creative activities space within their office for easels and musical instruments. In some instances, art faculty may prefer to have small offices and maintain a separate studio. In other instances, proration of the office space to two or more functional categories may be necessary. The room type facility which is called "office" often may be serving two different institutional purposes—instruction and research, for example.

It is also necessary to identify the persons who require office space by the type of occupant. These data typically are inferred from the titles (and departmental assignments) associated with the persons who require office space. For example, the amount of office space to be provided may be different for staff of faculty rank than for teaching assistants; or an executive secretary may require more space than a clerk in a clerical pool.

The degree of privacy required is another characteristic which must be determined for persons requiring office space. This information is necessary for two reasons. First, the amount of space per person usually is less in a multiple-person office than in a private office. Second, in existing institutions instances occur where faculty (or other staff) are housed in offices larger in area than would result from the normal application of institutional office space criteria. Such situations result from a complex set of interacting factors such as historical accident, old buildings, "departmental integrity," unavailability of other offices of appropriate size, and so on. In the final analysis, however, they occur because the principle of privacy for the person housed in such an over-sized office is considered to be more important than the square feet per person typically assumed for staff members of that particular category.

In most instances an office Station is assigned to one person. Some institutional operations, however, are on a shift basis, so that one office Station can serve more than one person requiring office space. Certain offices in the library and many offices in plant maintenance and protection are typical examples.

Where this occurs, the number of office Stations is not equal to the number of people requiring office space but to some lesser number, depending on the degree of multiple-shift use of the same office Station.

Conference Rooms

The designation of departments which require conference room space may or may not be stated explicitly as part of the program data which is available. If it is not indicated explicitly, then some working guidelines must be developed. Usually it is assumed that each organizational unit at least should have access to a conference room.

The number of Stations in a conference room relates directly to the number of persons it is designed to serve. For example, a conference room designed for the Biology Department normally has Stations equal to or slightly greater than the number of staff in that department. In other instances, particularly for conference rooms at the administrative level, the number of Stations is based upon the number of staff who are members of the committees which the conference room will serve. Other conference rooms (sometimes classified under other room types) used for continuing education programs, public service, or extension conferences are considered as special cases. The number of Stations in such conference rooms is a function of the conferences attracted by the educational program rather than of the staff responsible for the program.

The degree of exclusive use of conference rooms is a matter of institutional decision. It is not unusual for each academic department to have its own conference room. On the other hand, with a minimum of scheduling effort but some occasional conflicts of interest, it is possible for one conference room to serve two or more organizational units.

In some cases, it may be desirable to vary the Station allowance for conference room seating by departments. Although the practice is atypical, it does occur, nevertheless, at some institutions.

Section 2.1.3

Detailed Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

Offices

For each department

- ►Number of additional offices
- ►Number of additional Stations in offices
- ►Number of additional Assignable Square Feet in offices
- ►Number of additional Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of additional conference rooms
- ►Number of additional Stations in conference rooms
- ►Number of additional Assignable Square Feet in conference rooms
- ►Number of additional Assignable Square Feet in conference room service areas

PROCEDURE

1. Obtain from the Program Planning Procedures (see Manual Six) the program data for offices, conference rooms, and their related spaces for the target planning year.

Offices

For each department

- ►Number of persons (adjusted for multishift use) who require office space tabulated by
  - Type of occupant
  - Degree of privacy

Conference Rooms

- ►Designation of departments which require conference room space and specification of
  - Number of conferees
  - Degree of exclusive use

TABLE 21

NUMBER OF FULL-TIME EQUIVALENT PERSONNEL REQUIRING OFFICE SPACE FOR AN EXISTING INSTITUTION

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Number of FTE Personnel Requiring Office Space
ACADEMIC			
1. **Biological Sciences Division**	Administrator	Single	1.0
	Support	Single	1.0
2. Biology Department*	Professional	Single	5.0
		Double	2.0
	Graduate Asst.	Multiple	1.0
	Support	Double	2.0
3. Zoology Department	Professional	Single	2.0
		Double	2.5
	Graduate Asst.	Multiple	1.0
	Support	Double	1.0
4. **Physical Sciences Division**	Administrator	Single	1.0
	Support	Single	1.0
5. Mathematics Department	Professional	Single	5.0
		Double	4.5
	Graduate Asst.	Multiple	1.0
	Support	Double	1.5
6. Chemistry Department	Professional	Single	2.0
		Double	4.5
	Graduate Asst.	Multiple	2.0
	Support	Double	2.0
7. Geology Department	Professional	Single	2.0
		Double	2.5
	Graduate Asst.	Multiple	1.0
	Support	Double	2.0
8. Physics Department	Professional	Single	3.0
		Double	4.0
	Graduate Asst.	Multiple	2.0
	Support	Single	1.0
		Double	2.0
9. **Humanities Division**	Administrator	Single	1.0
	Support	Single	1.0
10. English Department	Professional	Single	6.0
		Double	8.5
	Support	Multiple	2.0
11. Fine Arts Department	Professional	Single (studio)	8.0
		Double	2.0
	Graduate Asst.	Double (studio)	4.0
	Support	Double	2.0
12. Philosophy Department	Professional	Single	7.0
		Double	5.0
	Support	Double	2.0
13. Classics Department	Professional	Single	1.0
		Double	1.0
	Support	Multiple	0.5
14. **Languages Division**	Administrator	Single	1.0
	Professional	Single	6.0
		Double	6.0
	Graduate Asst.	Multiple	2.0
	Support	Single	1.0
		Double	1.5
15. **Social Sciences Division**	Administrator	Single	1.0
	Support	Single	1.0
16. Political Science Department	Professional	Single	5.0
		Double	6.5
	Support	Double	1.5
17. History Department	Professional	Single	6.0
		Double	7.5
	Graduate Asst.	Multiple	1.0
	Support	Double	2.0

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*There are no department chairmen. Since the institution is small, the organizational structure is at the division level.

TABLE 21 (continued)

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Number of FTE Personnel Requiring Office Space
18. Economics Department	Professional	Single	4.0
		Double	4.0
	Support	Double	1.0
19. Psychology Department	Professional	Single	2.0
		Single (experimental)	2.0
		Double	4.5
	Support	Double	1.0
20. **Business Division**	Administrator	Single	1.0
	Professional	Single	5.0
		Double	6.0
	Support	Double	2.0
21. **Education Division**	Administrator	Single	1.0
	Professional	Single	3.0
		Double	4.0
	Support	Double	1.5
22. **Physical Education Division**	Administrator	Single	1.0
	Professional	Single	3.0
		Double	6.0
	Support	Double	2.0
Subtotal	N/A	N/A	216.5
NONACADEMIC			
1. Office of the President	Administrator	Single	1.0
	Professional	Single	1.0
	Support	Single	2.0
2. Office of the Academic Vice-President	Administrator	Single	1.0
	Support	Double	2.0
3. Office of the Administrative Vice-President	Administrator	Single	1.0
	Support	Double	2.0
4. Office of the Financial Vice-President	Administrator	Single	1.0
	Professional	Single	1.0
	Support	Single	1.0
5. Office of the Vice-President for Student Services	Administrator	Single	1.0
	Support	Double	2.0
6. Office of the Dean of the Graduate School	Administrator	Single	1.0
	Support	Double	2.0
7. Admissions Office	Professional	Single	2.0
	Support	Single	1.0
		Double	2.0
8. Registrar's Office	Professional	Single	2.0
	Support	Single	1.0
		Multiple	3.0
9. Budget Office	Professional	Single	2.0
	Support	Double	2.0
10. Business Office	Professional	Single	2.0
	Support	Multiple	2.5
11. Purchasing Office	Professional	Single	1.0
	Support	Multiple	2.5
12. Public Information Office	Professional	Double	2.0
	Support	Double	1.0
13. Publications Office	Professional	Single	1.0
	Support	Double	1.0
14. Auxiliary Services Office	Professional	Single	1.0
		Double	4.0
	Support	Single	1.0
		Multiple	8.0
15. Physical Plant Office	Administrator	Single	1.0
	Professional	Double	2.0
	Support	Double	4.0
Subtotal	N/A	N/A	68.0
TOTAL	N/A	N/A	284.5

TABLE 22

REQUIREMENTS FOR CONFERENCE SPACE FOR AN EXISTING INSTITUTION

(1)	(2)	(3)	(4)
Departments*	Total FTE In Depts.	FTE Size of Largest Dept.	Stations Required
ACADEMIC			
1. **Biological Sciences Division:** Biology and Zoology Departments	18.5	10.0	15
2. **Physical Sciences Division:** Mathematics and Chemistry Departments	24.5	12.0	15
3. Geology and Physics Departments	19.5	12.0	15
4. **Humanities Division:** English and Classics Departments	21.0	16.5	15
5. Fine Arts and Philosophy Departments	30.0	16.0	15
6. **Languages Division**	17.5	17.5	15
7. **Social Sciences Division:** Political Science and History Departments	31.5	16.5	20
8. Economics and Psychology Departments	18.5	9.5	10
9. **Business Division; Education Division**	23.5	14.0	15
10. **Physical Education Division**	12.0	12.0	10
Subtotal	216.5	N/A	145
NONACADEMIC			
1. Board of Directors	N/A	N/A	25
2. Nonacademic Departments	68	14	15 15
Subtotal	68	N/A	55
TOTAL	284.5	N/A	200

*The manner in which the departments are grouped indicates the "degree of exclusive use."

2. Establish as a matter of institutional policy allowances of Assignable Square Feet per office work Station.

Offices

For each department

►Number of Assignable Square Feet per office work Station tabulated by

- Type of occupant
- Degree of privacy

►Number of Assignable Square Feet of office service space tabulated by

- Size of department
- Extent of (record/office supply) storage

Conference Rooms

- ►Number of Assignable Square Feet per conference room Station tabulated by department
- ►Ad hoc determinations of conference room service area
- ►Degree of shared use of conference room by two or more departments

TABLE 23

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE WORK STATIONS* FOR AN EXISTING INSTITUTION

(1)	(2)	(3)	(4)	(5)
	Academic Departments		Nonacademic Departments	
Type of Occupant	Single Occupancy ASF/Station	Multiple Occupancy ASF/Station	Single Occupancy ASF/Station	Multiple Occupancy ASF/Station
1. Administrator—President	N/A	N/A	300 ± 50	N/A
Vice-Pres.	N/A	N/A	240 ± 30	N/A
Dean	240 ± 20	N/A	N/A	N/A
Chairman	180 ± 20	N/A	N/A	N/A
2. Professional	120 ± 10	90 ± 10	120 ± 20	90 ± 10
3. Secretarial-Clerical	120 ± 10	90 ± 20	120 ± 40	90 ± 20
4. Graduate Assistants	N/A	50 ± 10	N/A	N/A

*The office work Station allowances displayed in Table 23 are illustrative only and are not recommended as standards.

TABLE 24

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE SERVICE FACILITIES FOR AN EXISTING INSTITUTION*

(1)	(2)	(3)
	Assignable Square Feet of Service Space per Department*	
Department by Size (FTE Staff Requiring Office Work Stations)	Academic Depts.	Nonacademic Depts.
0 — 5	150 ± 25	150 ± 50
6 — 10	200 ± 25	200 ± 50
11 — 20	250 ± 25	250 ± 50
21 — 30	300 ± 25	300 ± 50
31 and above	350 ± 25 +5 ASF per each FTE Staff over 30	350 ± 50 +5 ASF per each FTE Staff over 30

*The office service space criteria displayed in Table 24 are illustrative only and are not recommended as standards.

In cases where "extent of storage" is required to be unusually high, special storage areas must be added to the above normal amount of recommended office service space. This can be done on an ASF per file unit basis times the number of file units required for program activities.

TABLE 25

ASSIGNABLE SQUARE FEET CRITERIA FOR CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES FOR AN EXISTING INSTITUTION*

Conference Room Assignable Square Feet per Station		Conference Room Service Space in Assignable Square Feet per Conference Room
Stations	Assignable Square Feet per Station	
10	25	30 ± 5**
15	22	30 ± 5
20	20	30 ± 5
25	20	30 ± 5
30	18	30 ± 5

*The conference room and conference room service assignable square feet displayed in Table 25 are illustrative only and are not recommended as standards.

**Does not include chair storage.

3. Calculate the office, conference room, and related space requirements.

Offices

For each department

- Number of offices
- Number of Stations in each office
- Number of Assignable Square Feet in each office
- Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- Number of conference rooms
- Number of Stations in each conference room
- Number of Assignable Square Feet in each conference room
- Number of Assignable Square Feet in conference room service areas

TABLE 26
REQUIREMENTS FOR OFFICE FACILITIES FOR AN EXISTING INSTITUTION

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Department	Type of Occupant	Degree of Privacy	Number of FTE Personnel Requiring Office Space	Number of Work Stations Required[a]	Number of Offices Required	Assignable Square Feet per Office Required	Total Assignable Square Feet Required (8)=(6)x(7)
ACADEMIC							
1. **Biological Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	130	130
2. Biology Department	Professional	Single	5.0	5	5	130	650
		Double	2.0	2	1	180	180
	Graduate Asst.	Multiple	1.0	3[b]	1	150	150
	Support	Double	2.0	2	1	180	180
3. Zoology Department	Professional	Single	2.0	2	2	130	260
		Double	2.5	3	2	180	360
	Graduate Asst.	Multiple	1.0	0[b]	0	150	0
	Support	Double	1.0	2	1	180	180
4. **Physical Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	130	130
5. Mathematics Department	Professional	Single	5.0	5	5	130	650
		Double	4.5	5	3	180	540
	Graduate Asst.	Multiple	1.0	0[b]	0	150	0
	Support	Double	1.5	2	1	180	180
6. Chemistry Department	Professional	Single	2.0	2	2	130	260
		Double	4.5	5	3	180	540
	Graduate Asst.	Multiple	2.0	3[c]	1	150	150
	Support	Double	2.0	2	1	180	180
7. Geology Department	Professional	Single	2.0	2	2	130	260
		Double	2.5	3	1	180	180
	Graduate Asst.	Multiple	1.0	0[c]	0	150	0
	Support	Double	2.0	2	1	180	180
8. Physics Department	Professional	Single	3.0	3	3	130	390
		Double	4.0	4	2	180	360
	Graduate Asst.	Multiple	2.0	3[d]	1	150	150
	Support	Single	1.0	1	1	130	130
		Double	2.0	2	1	180	180
9. **Humanities Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	130	130
10. English Department	Professional	Single	6.0	6	6	130	780
		Double	8.5	9	5	180	900
	Support	Multiple	2.0	2	1	180	180
11. Fine Arts Department	Professional	Single (studio)	8.0	8	8	240	1,920
		Double	2.0	2	1	180	180
	Graduate Asst.	Double (studio)	4.0	4	2	200*	400
	Support	Single	2.0	2	2	120	240
12. Philosophy Department	Professional	Single	7.0	7	7	130	910
		Double	5.0	5	3	180	540
	Support	Double	2.0	2	1	180	180
13. Classics Department	Professional	Single	1.0	1	1	120	120
		Double	1.0	1	1	180	180
	Support	Multiple	0.5	0[e]	0	90	0
14. **Languages Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	6.0	6	6	120	720
		Double	6.0	6	3	180	540
	Graduate Asst.	Multiple	2.0	3[f]	1	150	150
	Support	Single	1.0	1	1	120	120
		Double	1.5	2[e]	1	180	180
15. **Social Sciences Division**	Administrator	Single	1.0	1	1	180	180
	Support	Single	1.0	1	1	120	120
16. Political Science Department	Professional	Single	5.0	5	5	120	600
		Double	6.5	7	4	180	720
	Support	Double	1.5	2	1	180	180
17. History Department	Professional	Single	6.0	6	6	120	720
		Double	7.5	8	4	180	720

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*Additional space is provided in these offices for "scholarly activities."

a. Office Stations are allowed generally on the basis of one Station for each FTE staff requiring office space.

b. Graduate assistants in the Departments of Biology, Zoology, and Mathematics will share an office.

c. Graduate assistants in the Departments of Chemistry and Geology will share an office.

d. One extra Station for a graduate assistant will be provided in this office.

e. Support staff in the Classics Department and Languages Division will share an office.

TABLE 26 (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Department	Type of Occupant	Degree of Privacy	Number of FTE Personnel Requiring Office Space	Number of Work Stations Required	Number of Offices Required	Assignable Square Feet per Office Required	Total Assignable Square Feet Required (8)=(6)x(7)
	Graduate Asst.	Multiple	1.0	0[f]	0	150	0
	Support	Double	2.0	2	1	180	180
18. Economics Department	Professional	Single	4.0	4	4	120	480
		Double	4.0	4	2	180	360
	Support	Double	1.0	1	1	180	180
19. Psychology Department	Professional	Single	2.0	2	2	120	240
		Single (exper.)	2.0	2	2	240	480
		Double	4.5	5	3	180	540
	Support	Double	1.0	1	0	180	0
20. **Business Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	5.0	5	5	120	600
		Double	6.0	6	3	180	540
	Support	Double	2.0	2	1	180	180
21. **Education Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	3.0	3	3	120	360
		Double	4.0	4	2	180	360
	Support	Double	1.5	2	1	180	180
22. **Physical Education Division**	Administrator	Single	1.0	1	1	180	180
	Professional	Single	3.0	3	3	120	360
		Double	6.0	6	3	180	540
	Support	Double	2.0	2	1	180	180
Subtotal	N/A	N/A	216.5	224	160	N/A	25,180
NONACADEMIC							
1. Office of the President	Administrator	Single	1.0	1	1	300	300
	Professional	Single	1.0	1	1	140	140
	Support	Single	2.0	2	2	160	320
2. Office of the Academic Vice-President	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
3. Office of the Administrative Vice-President	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
4. Office of the Financial Vice-President	Administrator	Single	1.0	1	1	250	250
	Professional	Single	1.0	1	1	140	140
	Support	Single	1.0	1	1	160	160
5. Office of the Vice-President for Student Services	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
6. Office of the Dean of the Graduate School	Administrator	Single	1.0	1	1	250	250
	Support	Double	2.0	2	1	180	180
7. Admissions Office	Professional	Single	2.0	2	2	140	280
	Support	Single	1.0	1	1	160	160
		Double	2.0	2	1	180	180
8. Registrar's Office	Professional	Single	2.0	2	2	140	280
	Support	Single	1.0	1	1	160	160
		Multiple	3.0	3	1	270	270
9. Budget Office	Professional	Single	2.0	2	2	140	280
	Support	Double	2.0	2	1	180	180
10. Business Office	Professional	Single	2.0	2	2	140	280
	Support	Multiple	2.5	3	1	270	270
11. Purchasing Office	Professional	Single	1.0	1	1	140	140
	Support	Multiple	2.5	3	1	270	270
12. Public Information Office	Professional	Double	2.0	2	1	180	180
	Support	Double	1.0	1	7	180	180
13. Publications Office	Professional	Single	1.0	1	1	140	140
	Support	Double	1.0	1	7	180	0
14. Auxiliary Services Office	Professional	Single	1.0	1	1	140	140
		Double	4.0	4	2	180	360
	Support	Single	1.0	1	1	160	160
		Multiple	8.0	8	2	360	360
15. Physical Plant Office	Administrator	Single	1.0	1	1	250	250
	Professional	Double	2.0	2	1	180	180
	Support	Double	4.0	4	2	180	360
Subtotal	N/A	N/A	68.0	69	44	N/A	8,090
TOTAL	N/A	N/A	284.5	293	204	N/A	33,270

f. Graduate assistants in the Languages Division and History Department will share an office.

TABLE 27

REQUIREMENTS FOR OFFICE SERVICE SPACE FOR AN EXISTING INSTITUTION

(1) Department	(2) Number of FTE Staff Requiring Office Work Stations	(3) Required Assignable Square Feet of Office Service Facilities
ACADEMIC		
1. **Biological Sciences Division**	2.0	140
2. Biology Department	10.0	225
3. Zoology Department	6.5	180
4. **Physical Sciences Division**	2.0	140
5. Mathematics Department	12.0	245
6. Chemistry Department	10.5	245
7. Geology Department	7.5	180
8. Physics Department	12.0	245
9. **Humanities Division**	2.0	125
10. English Department	16.5	225
11. Fine Arts Department	16.0	225
12. Philosophy Department	14.0	225
13. Classics Department	2.5	125
14. **Languages Division**	17.5	275
15. **Social Sciences Division**	2.0	125
16. Political Science Department	13.0	225
17. History Department	16.5	225
18. Economics Department	9.0	175
19. Psychology Department	9.5	175
20. **Business Division**	14.0	225
21. **Education Division**	9.5	175
22. **Physical Education Division**	12.0	175
Subtotal	216.5	4,300
NONACADEMIC		
1. Office of the President	4.0	300
2. Office of the Academic Vice-President	3.0	160
3. Office of the Administrative Vice-President	3.0	160
4. Office of the Financial Vice-President	3.0	160
5. Office of the Vice-President for Student Services	3.0	160
6. Office of the Dean of the Graduate School	3.0	160
7. Admissions Office	5.0	260
8. Registrar's Office	6.0	460
9. Budget Office	4.0	160
10. Business Office	4.5	160
11. Purchasing Office	3.5	300
12. Public Information Office	3.0	166
13. Publications Office	2.0	160
14. Auxiliary Services Office	14.0	220
15. Physical Plant Office	7.0	160
Subtotal	68.0	3,140
TOTAL	284.5	7,440

TABLE 28

REQUIREMENTS FOR CONFERENCE ROOMS AND CONFERENCE ROOM SERVICE FACILITIES FOR AN EXISTING INSTITUTION

1)	(2)	(3)	(4)	(5)	(6)
Departments	Stations Required	ASF/ Station Factor	Conference Room ASF (4)=(3)x(2)	Conference Service Factor ASF	Conference Service ASF (6)=(4)x(5)
ACADEMIC					
1. **Biological Sciences Division:** Biology and Zoology Departments	15	22	330	30 ± 5	30
2. **Physical Sciences Division:** Mathematics and Chemistry Departments	15	22	330	30 ± 5	30
3. Geology and Physics Departments	15	22	330	30 ± 5	30
4. **Humanities Division:** English and Classics Departments	15	22	330	30 ± 5	30
5. Fine Arts and Philosophy Departments	25	20	500	30 ± 5	35
6. **Languages Division**	15	22	330	30 ± 5	30
7. **Social Sciences Division:** Political Science and History Departments	20	20	400	30 ± 5	35
8. Economics and Sociology Departments	10	25	250	30 ± 5	25
9. **Business Division; Education Division**	15	22	330	30 ± 5	30
10. **Physical Education Division**	10	25	250	30 ± 5	25
Subtotal	155	N/A	3,380	N/A	300
NONACADEMIC					
1. Board of Directors	25	20	400	30 ± 5	35
2. Nonacademic Departments	15	22	330	30 ± 5	30
	15	22	330	30 ± 5	30
Subtotal	55	N/A	1,060	N/A	95
TOTAL	210	N/A	4,440	N/A	395

4. Obtain from the facilities inventory the data on existing offices, conference rooms, and related service areas.

Offices

For each department

►Number of offices tabulated by

- Type of occupant
- Degree of privacy

►Number of Stations in each office
►Number of Assignable Square Feet in each office
►Number of Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of conference rooms
- ►Number of Stations in each conference room
- ►Number of Assignable Square Feet in each conference room
- ►Number of Assignable Square Feet in conference service areas

TABLE 29

CAPACITY OF EXISTING OFFICE FACILITIES

(1) Department	(2) Type of Occupant	(3) Degree of Privacy	(4) Number of Work Stations Available	(5) Number of Offices Available	(6) Assignable Sq. Feet per Office	(7) Total Assignable Sq. Feet (7)=(5)x(6)
ACADEMIC						
1. **Biological Sciences Division**	Administrator	Single	1	1	128	128
	Support	Double	2	1	150	150
2. Biology Dept.	Professional	Single	4	4	110	440
		Single	1	1	119	119
3. Zoology Dept.	Professional	Single	2	2	110	220
		Single	2	2	121	242
	Graduate Asst.	Double	2	1	131	131
4. **Physical Sciences Division**	Administrator	Single	1	1	191	191
	Support	Double	2	1	131	131
5. Mathematics Dept.	Professional	Single	4	4	100	400
		Double	2	1	160	160
	Graduate Asst.	Multiple	3	1	98	98
	Support	Single	1	1	80	80
6. Chemistry Dept.	Professional	Single	2	2	120	240
		Double	2	1	204	204
		Double	2	1	223	223
	Support	Single	1	1	126	126
7. Geology Dept.	Professional	Single	2	2	95	190
		Single	1	1	143	143
8. Physics Dept.	Professional	Single	2	2	118	236
		Double	2	1	192	192
		Double	2	1	133	133
9. **Humanities Division**	Administrator	Single	1	1	154	154
	Support	Double	2	1	144	144
10. English Dept.	Professional	Single	4	4	121	484
		Single	2	2	100	200
		Double	4	2	157	314
11. Fine Arts Dept.	Professional	Single	7	7	122	854
		Double	4	2	147	294
	Support	Multiple	3	1	217	217
12. Philosophy Dept.	Professional	Single	6	6	111	666
		Single	1	1	100	100
		Double	2	1	181	181
	Support	Single	1	1	156	156
13. Classics Dept.	Professional	Single	1	1	155	155
14. **Languages Division**	Administrator	Single	1	1	144	144
	Professional	Single	6	6	144	864
		Single	3	3	112	336
	Graduate Asst.	Multiple	3	1	144	144
	Support	Double	2	1	144	144
15. **Social Sciences Division**	Administrator	Single	1	1	124	124
	Support	Double	2	1	144	144
16. Political Science Dept.	Professional	Single	6	6	102	612
		Single	1	1	95	95
		Double	2	1	180	180
17. History Dept.	Professional	Single	4	4	104	416
		Single	1	1	139	139
		Double	6	3	200	600
	Support	Single	1	1	90	90

TABLE 29 (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Department	Type of Occupant	Degree of Privacy	Number of Work Stations Available	Number of Offices Available	Assignable Sq. Feet per Office	Total Assignable Sq. Feet (7)=(5)x(6)
18. Economics Dept.	Professional	Single	4	4	103	412
		Double	2	1	180	180
19. Psychology Dept.	Professional	Single	5	5	103	515
20. **Business Division**	Administrator	Single	1	1	103	103
	Professional	Single	4	4	95	380
		Double	6	3	186	558
	Support	Multiple	3	1	196	196
21. **Education Division**	Administrator	Single	1	1	130	130
	Professional	Single	4	4	103	412
		Double	2	1	166	166
	Support	Double	1	1	130	130
22. **Physical Education Division**	Professional	Single	4	4	130	520
		Double	2	1	195	195
Subtotal	N/A	N/A	159	125	N/A	16,025
NONACADEMIC						
1. Office of the President	Administrator	Single	1	1	265	265
	Professional	Single	1	1	110	110
	Support	Single	1	1	120	120
2. Office of the Academic Vice-President	Administrator	Single	1	1	120	120
	Support	Single	1	1	90	90
3. Office of the Administrative Vice-President	Administrator	Single	1	1	158	158
	Professional	Single	1	1	110	110
	Support	Double	2	1	176	176
4. Office of the Financial Vice-President	Administrator	Single	1	1	154	154
	Support	Double	2	1	140	140
5. Office of the Vice-President for Student Services	Administrator	Single	1	1	140	140
	Support	Multiple	3	1	182	182
6. Office of the Dean of the Graduate School*	Support	Double	2	1	182	182
7. Admissions Office	Professional	Single	1	1	100	100
	Support	Double	2	1	170	170
8. Registrar's Office	Professional	Single	2	2	100	200
	Support	Double	2	1	187	187
9. Budget Office	Professional	Single	1	1	137	137
	Support	Single	1	1	100	100
10. Business Office	Professional	Double	2	1	178	178
	Support	Multiple	4	1	278	278
11. Purchasing Office	Professional	Single	1	1	112	112
12. Public Information Office	Professional	Single	1	1	112	112
	Support	Double	2	1	112	112
13. Publications Office	Professional	Single	1	1	112	112
14. Auxiliary Services Office	Professional	Single	4	4	131	524
	Support	Single	3	3	102	306
		Single	3	3	98	294
		Double	2	1	184	184
15. Physical Plant Office	Professional	Single	1	1	110	110
		Double	2	1	166	166
	Support	Multiple	3	1	200	200
Subtotal	N/A	N/A	56	40	N/A	5,529
TOTAL	N/A	N/A	215	165	N/A	21,554

*One person holds the joint appointment of Administrative Vice-President and Dean of the Graduate School.

TABLE 30
TABULATION OF EXISTING OFFICE SERVICE FACILITIES

(1)	(2)
Department	Assignable Square Feet of Office Service Facilities
ACADEMIC	
1. **Biological Sciences Division**	8
2. Biology Department	22
3. Zoology Department	94
4. **Physical Sciences Division**	25
5. Mathematics Department	70
6. Chemistry Department	56
7. Geology Department	40
8. Physics Department	72
9. **Humanities Division**	40
10. English Department	102
11. Fine Arts Department	98
12. Philosophy Department	86
13. Classics Department	10
14. **Languages Division**	96
15. **Social Sciences Division**	47
16. Political Science Department	100
17. History Department	106
18. Economics Department	62
19. Psychology Department	54
20. **Business Division**	108
21. **Education Division**	76
22. **Physical Education Division**	84
Subtotal	1,456
NONACADEMIC	
1. Office of the President	45
2. Office of the Academic Vice-President	16
3. Office of the Administrative Vice-President	32
4. Office of the Financial Vice-President	36
5. Office of the Vice-President for Student Services	18
6. Office of the Dean of the Graduate School	18
7. Admissions Office	110
8. Registrar's Office	88
9. Budget Office	46
10. Business Office	46
11. Purchasing Office	46
12. Public Information Office	22
13. Publications Office	82
14. Auxiliary Services Office	56
15. Physical Plant Office	66
Subtotal	727
TOTAL	2,183

TABLE 31

CAPACITY OF EXISTING CONFERENCE FACILITIES

(1) Department*	(2) Number of Conference Rooms	(3) Stations in Each Conference Room	(4) Assignable Square Feet in Each Conference Room	(5) Assignable Square Feet in Conference Room Service
ACADEMIC				
1. **Biological Sciences Division:** Biology and Zoology Departments; **Mathematics and Physical Sciences Division:** Mathematics, Chemistry, Geology, and Physics Departments	1	15	225	0
2. **Languages Division; Humanities Division:** English, Fine Arts, Philosophy, and Classics Departments	1	15	353	22
3. **Social Sciences Division:** Political Science, History, Economics, and Psychology Departments	1	20	270	30
4. **Business Division; Education Division**	1	15	360	15
5. **Physical Education Division**	1	15	340	35
Subtotal	5	N/A	1,548	102
NONACADEMIC				
1. Board of Directors	1	25	600	25
2. Nonacademic Departments	1	10	100	20
Subtotal	2	N/A	700	45
TOTAL	7	N/A	2,248	147

*The departmental groupings listed in Table 31 indicate the degree of shared use.

5. Compare the facilities inventory and assignment of existing office and office related space with the projected requirements.

Offices

For each department

- ►Number of additional offices
- ►Number of additional Stations in offices
- ►Number of additional Assignable Square Feet in offices
- ►Number of additional Assignable Square Feet in office service areas

Conference Rooms

For each department

- ►Number of additional conference rooms
- ►Number of additional Stations in conference rooms
- ►Number of additional Assignable Square Feet in conference rooms
- ►Number of additional Assignable Square Feet in conference room service areas

TABLE 32

COMPARISON OF PROJECTED OFFICE FACILITY REQUIREMENTS WITH EXISTING CAPACITY

(1)	(2)	(3)	(4)	(5)	(6)
Department	Type of Occupant	Degree of Privacy	Number of Additional Stations	Number of Additional Offices	Number of Additional Assignable Square Feet
ACADEMIC					
1. **Biological Sciences Division**	Administrator	Single	0	0	52
	Support	Single	(—1)	0	(—20)
2. Biology Department	Professional	Single	0	0	91
		Double	2	1	180
	Graduate Asst.	Multiple	3	1	150
	Support	Double	2	1	180
3. Zoology Department	Professional	Single	(—2)	(—2)	(—202)
		Double	3	2	360
	Graduate Asst.	Multiple	(—2)	(—1)	(—131)
	Support	Double	2	1	180
4. **Physical Sciences Division**	Administrator	Single	0	0	(—11)
	Support	Single	(—1)	0	(—1)
5. Mathematics Department	Professional	Single	1	1	250
		Double	3	2	380
	Graduate Asst.	Multiple	(—3)	(—1)	(—98)
	Support	Double	1	0	100
6. Chemistry Department	Professional	Single	0	0	20
		Double	1	1	113
	Graduate Asst.	Multiple	3	1	150
	Support	Double	1	0	54
7. Geology Department	Professional	Single	(—1)	(—1)	(—73)
		Double	3	1	180
	Graduate Asst.	Multiple	0	0	0
	Support	Double	2	1	180
8. Physics Department	Professional	Single	1	1	154
		Double	0	0	35
	Graduate Asst.	Multiple	3	1	150
	Support	Single	1	1	130
		Double	2	1	180
9. **Humanities Division**	Administrator	Single	0	0	26
	Support	Single	(—1)	0	(—14)
10. English Department	Professional	Single	0	0	96
		Double	5	3	586
	Support	Multiple	2	1	180
11. Fine Arts Department	Professional	Single (studio)	8	8	1,920
		Single	(—7)	(—7)	(—854)
		Double	(—2)	(—1)	(—114)
	Graduate Asst.	Double (studio)	4	2	400
	Support	Single	2	2	240
		Multiple	(—3)	(—1)	(—217)
12. Philosophy Department	Professional	Single	0	0	144
		Double	3	2	359
	Support	Double	1	0	24
13. Classics Department	Professional	Single	0	0	(—35)
		Double	1	1	180
	Support	Multiple	0	0	0
14. **Languages Division**	Administrator	Single	0	0	36
	Professional	Single	(—3)	(—3)	(—480)
		Double	6	3	540
	Graduate Asst.	Multiple	0	0	6
	Support	Single	1	1	120
		Double	0	0	36
15. **Social Sciences Division**	Administrator	Single	0	0	56
	Support	Single	(—1)	0	(—24)
16. Political Science Department	Professional	Single	(—2)	(—2)	(—107)
		Double	5	3	540
	Support	Double	2	1	180
17. History Department	Professional	Single	1	1	165
		Double	2	1	120
	Graduate Asst.	Multiple	0	0	0
	Support	Double	1	0	90
18. Economics Department	Professional	Single	0	0	68
		Double	2	1	180
	Support	Double	1	1	180

TABLE 32 (continued)

(1)	(2)	(3)	(4)	(5)	(6)
Department	Type of Occupant	Degree of Privacy	Number of Additional Stations	Number of Additional Offices	Number of Additional Assignable Square Feet
19. Psychology Department	Professional	Single	(—3)	(—3)	(—275)
		Single (exper.)	2	2	480
		Double	5	3	540
	Support	Double	1	0	0
20. **Business Division**	Administrator	Single	0	0	77
	Professional	Single	1	1	220
		Double	0	0	(—18)
	Support	Double	(—1)	0	(—16)
21. **Education Division**	Administrator	Single	0	0	50
	Professional	Single	(—1)	(—1)	(—52)
		Double	2	1	194
	Support	Double	1	0	50
22. **Physical Education**	Administrator	Single	1	1	180
	Professional	Single	(—1)	(—1)	(—160)
		Double	4	2	345
	Support	Double	2	1	180
Subtotal	N/A	N/A	65	35	9,155
NONACADEMIC					
1. Office of the President	Administrator	Single	0	0	35
	Professional	Single	0	0	30
	Support	Single	1	1	200
2. Office of the Academic Vice-President	Administrator	Single	0	0	130
	Support	Double	1	0	90
3. Office of the Administrative Vice-President	Administrator	Single	0	0	92
	Professional	Single	(—1)	(—1)	(—110)
	Support	Double	0	0	4
4. Office of the Financial Vice-President	Administrator	Single	0	0	96
	Professional	Single	1	1	140
	Support	Single	(—1)	0	20
5. Office of the Vice-President for Student Services	Administrator	Single	0	0	110
	Support	Double	(—1)	0	(—2)
6. Office of the Dean of the Graduate School	Administrator	Single	1	1	250
	Support	Double	0	0	(—2)
7. Admissions Office	Professional	Single	1	1	180
	Support	Single	1	1	160
		Double	0	0	10
8. Registrar's Office	Professional	Single	0	0	80
	Support	Single	1	1	160
		Multiple	1	0	83
9. Budget Office	Professional	Single	1	1	143
	Support	Double	1	0	80
10. Business Office	Professional	Single	0	1	102
	Support	Multiple	(—1)	0	(—8)
11. Purchasing Office	Professional	Single	0	0	28
	Support	Multiple	3	1	270
12. Public Information Office	Professional	Double	1	0	68
	Support	Double	(—1)	0	68
13. Publications Office	Professional	Single	0	0	28
	Support	Double	1	0	0
14. Auxiliary Services Office	Professional	Single	(—3)	(—3)	(—384)
		Double	4	2	360
	Support	Single	(—5)	(—5)	(—440)
		Multiple	6	1	176
15. Physical Plant Office	Administrator	Single	0	0	140
	Professional	Double	0	0	14
	Support	Double	1	1	160
Subtotal	N/A	N/A	13	4	2,561
TOTAL	N/A	N/A	78	39	11,716

TABLE 33

DIVISION SUMMARY OF PROJECTED OFFICE REQUIREMENTS COMPARED WITH EXISTING OFFICE FACILITIES

(1)	(2)	(3)	(4)	(5)
Division	Requirements	Number of Stations	Number of Offices	Assignable Square Feet
Biological Sciences	Projected	21	15	2,270
	Existing	—14	—12	—1,430
	Difference	7	3	840
Physical Sciences	Projected	46	30	4,640
	Existing	—29	—21	—2,747
	Difference	17	9	1,893
Humanities	Projected	51	40	6,840
	Existing	—38	—30	—3,919
	Difference	13	10	2,921
Languages	Projected	19	13	1,890
	Existing	—15	—12	—1,632
	Difference	4	1	258
Social Sciences	Projected	51	37	5,700
	Existing	—35	—29	—3,507
	Difference	16	8	2,193
Business	Projected	14	10	1,500
	Existing	—14	—9	—1,237
	Difference	0	1	263
Education	Projected	10	7	1,080
	Existing	—8	—7	—838
	Difference	2	0	242
Physical Education	Projected	12	8	1,260
	Existing	—6	—5	—715
	Difference	6	3	545
Nonacademic	Projected	69	44	8,090
	Existing	—56	—40	—5,529
	Difference	13	4	2,561
TOTAL	Projected	293	204	33,270
	Existing	—215	—165	—21,554
	Difference	78	39	11,716

TABLE 34

COMPARISON OF PROJECTED OFFICE SERVICE REQUIREMENTS WITH EXISTING OFFICE SERVICE FACILITIES

(1)	(2)	(3)	(4)
Department	Existing Assignable Square Feet	Projected Office Service Space	Additional Space Required
ACADEMIC			
1. **Biological Sciences Division**	8	140	132
2. Biology Department	22	225	203
3. Zoology Department	94	180	86
4. **Physical Sciences Division**	25	140	115
5. Mathematics Department	70	245	175
6. Chemistry Department	56	245	189
7. Geology Department	40	180	140
8. Physics Department	72	245	173
9. **Humanities Division**	40	125	85
10. English Department	102	225	123
11. Fine Arts Department	98	225	127
12. Philosophy Department	86	225	139
13. Classics Department	10	125	115
14. **Languages Division**	96	275	179
15. **Social Sciences Division**	47	125	78
16. Political Science Department	100	225	125
17. History Department	106	225	119
18. Economics Department	62	175	113
19. Psychology Department	54	175	121
20. **Business Division**	108	225	117
21. **Education Division**	76	175	99
22. **Physical Education Division**	84	175	91
Subtotal	1,456	4,300	2,844
NONACADEMIC			
1. Office of the President	45	300	255
2. Office of the Academic Vice-President	16	160	144
3. Office of the Administrative Vice-President	32	160	128
4. Office of the Financial Vice-President	36	160	124
5. Office of the Vice-President for Student Services	18	160	142
6. Office of the Dean of the Graduate School	18	160	142
7. Admissions Office	110	260	150
8. Registrar's Office	88	460	372
9. Budget Office	46	160	114
10. Business Office	46	160	114
11. Purchasing Office	46	300	254
12. Public Information Office	22	166	144
13. Publications Office	82	160	78
14. Auxiliary Services Office	56	220	164
15. Physical Plant Office	66	160	94
Subtotal	727	3,146	2,419
TOTAL	2,183	7,446	5,263

TABLE 35

COMPARISON OF PROJECTED CONFERENCE FACILITIES WITH CAPACITY OF EXISTING CONFERENCE FACILITIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Conference Room			Conference Room Service		
Department	Assignable Square Feet Existing	Assignable Square Feet Required	Additional Space Required	Assignable Square Feet Existing	Assignable Square Feet Required	Additional Space Required
ACADEMIC						
1. **Biological Sciences Division:** Biology and Zoology Departments	225	330	105	0	30	30
2. **Physical Sciences Division:** Mathematics, and Chemistry Departments	0	330	330	0	30	30
3. Geology and Physics Departments	0	330	330	0	30	30
4. **Humanities Division:** English and Classics Departments	353	330	(—23)	22	30	8
5. Fine Arts and Philosophy Departments	0	500	500	0	35	30
6. **Languages Division**	0	330	330	0	30	30
7. **Social Sciences Division:** Political Science and History Departments	270	400	130	30	35	5
8. Economics and Sociology Departments	0	250	250	0	25	25
9. **Business Division; Education Division**	360	330	(—30)	15	30	15
10. **Physical Education Division**	340	250	(—90)	35	25	(—10)
Subtotal	1,548	3,380	1,832	102	300	198
NONACADEMIC						
1. Board of Directors	600	400	(—200)	25	35	10
2. Nonacademic Departments	100	660	560	20	60	40
Subtotal	700	1,060	360	45	95	50
TOTAL	2,248	4,440	2,192	147	395	248

The comparison of projected office, office service, and conference space with existing space may be summarized in an "overall" table, as shown in Table 36, to identify more fully the required increase in office facilities. In this example, 19,419 Assignable Square Feet of combined office and office related space is needed.

TABLE 36

OVERALL COMPARISON OF PROJECTED OFFICE, OFFICE SERVICE, AND CONFERENCE FACILITIES REQUIREMENTS WITH EXISTING CAPACITY

(1) Type of Facility	(2) Requirements	(3) Number of Stations	(4) Number of Offices	(5) Assignable Square Feet
Office	Projected	293	204	33,270
	Existing	—215	—165	—21,554
	Difference	78	39	11,716
Office Service	Projected	N/A	N/A	7,446
	Existing	N/A	N/A	—2,188
	Difference	N/A	N/A	5,263
Conference	Projected	210	13	4,835
	Existing	—115	—7	—2,395
	Difference	95	6	2,440
TOTAL	Projected	503	217	45,551
	Existing	—330	—172	—26,132
	Difference	173	45	19,419

CONCLUSION

The purpose of this section and those preceding sections of Manual Three is to provide evaluation and projection procedures for office and office related space. This section, therefore, concludes with the quantitative determination of office needs.

Separate measures and techniques must subsequently be utilized in order to define and prepare an implementation plan whereby the space may be obtained. The amount of new construction, assignment of departments, and relocation staging are among the key items which are considered in procedures for implementation. These topics and others are discussed in Manual Six.

Section 2.2.

General Method

OFFICE AND OFFICE RELATED FACILITIES

INTRODUCTORY COMMENTS

General methods such as the one described on the following pages can be very useful. They can also be misused easily and therefore may be dangerous in the hands of the novice. The limitations of the general method are so severe that its use should be restricted to those institutions which can monitor constantly the validity of the assumptions involved. When such validity can be assured, the general method may serve as an adequate "rule-of-thumb" estimate of overall office and office related space requirements. If, however, the application of the method results in a decision to add, alter, or abandon existing space, then these general estimates *must* be modified by a complete analysis as outlined in the preceding Detailed Method section.

Typically, general methods rely entirely on averages and yield only total requirements. For the evaluation of existing space they yield only total persons requiring office space, juxtaposed against total Assignable Square Feet available for office and office related space needs. For a new institution as well as an existing institution this general method establishes only the total number of Assignable Square Feet.

There are other general methods for approximating requirements for office and office related facilities. One of the more prevalent of these is based on allowances of Assignable Square Feet per full-time equivalent student. Although this technique may well be useful at individual institutions, to discuss and illustrate it unleashes many more difficulties than the results warrant. Variations in student/faculty ratios and in definitions of part-time equivalency enervate any attempt to properly illustrate the task. It is felt that the general method explained on the following pages is adequate as far as any approximate techniques are concerned.

Section 2.2.1

General Method

EVALUATION OF THE CAPACITY OF EXISTING OFFICE AND OFFICE RELATED FACILITIES

DISCUSSION

DATA TO BE DETERMINED

►Adequacy of existing office and office related facilities

PROGRAM DATA REQUIRED

►Number of FTE staff who currently require office space tabulated by

- Type of occupant
- Type of department*

FACILITIES DATA REQUIRED

►Number of Assignable Square Feet in existing office and office related facilities

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

PROCEDURE

1. Obtain the required facilities data.

   ►Number of Assignable Square Feet in existing office and office related facilities

   This information should be available in the institution's facilities inventory.

2. Obtain the program data concerning the requirements for office facilities.

   ►Number of FTE staff who currently require office space tabulated by

   - Type of occupant
   - Type of department

3. Establish as a matter of institutional policy allowances of average Assignable Square Feet required per FTE staff.

   ►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

   It should be emphasized that use of the term "office and office related facilities" implies the inclusion of allowances not only for work Station needs, but also for office service, conference room, and conference room service needs as well. Use of a factor which is not adjusted in this way will result in a misleading evaluation of current requirements.

---

*Academic or nonacademic.

It is important to remember when establishing these allowances that they are not design allowances and, also, that they must include consideration of needs for all types of office and office related facilities.

4. Determine the existing office and office related facilities requirements.

   This determination is the product of the allowances established in the preceding step and the number of persons requiring office work space determined in step 2.

5. Compare current requirements for office and office related facilities with available facilities.

COMMENTS ON THE PROCEDURE

As with all general methods, the technique is based on several simplifying assumptions and, therefore, has numerous limitations.

First, while number of Stations *should* be a more accurate indicator of current capacity than area, there is considerable difficulty associated with arriving at this number. It is impossible to specify an exact or optimum number of Stations in a particular room since this number varies as a function of the user of the room. The same room might accommodate one department chairman or two clerical employees or three graduate assistants. Specifically, the generalized assumption must be that all rooms will continue to be occupied by employees of the same type as the current occupants and that the evaluation will be based on area requirements rather than numbers of Stations or numbers of offices. To obviate the restrictions by this assumption, a review of assignments on a room-by-room basis is required, revising them where necessary. The amount of effort and the level of detail associated with this process are inconsistent with the objectives of a general methodology. Therefore, for quick estimation purposes, it is suggested that the simplifying assumptions about use of current space be accepted but that the limitations of the procedure be recognized.

Second, the very important consideration of physical location of office space is ignored. Departmental considerations are neglected except for the distinction between academic and nonacademic departments. The inefficiencies of space assignment which develop because it is difficult to house a clerk from the registrar's office at the empty desk in the treasurer's office or to assign the chemistry faculty member space in the midst of the archeologists are not recognized in this method.

Departmental affiliations are extremely important in projecting needs for office space, but cannot be taken into account except through use of the detailed methodology described previously.

Section 2.2.1

General Method

EVALUATION OF THE CAPACITY OF EXISTING OFFICE AND OFFICE RELATED FACILITIES

EXAMPLE

DATA TO BE DETERMINED ►Adequacy of existing office and office related facilities

PROCEDURE

1. Obtain the required facilities data.

►Number of Assignable Square Feet in existing office and office related facilities

Number of Assignable Square Feet in existing office and office related facilities* = 26,132 ASF

2. Obtain the program data concerning the requirements for office facilities.

►Number of FTE staff who currently require office space tabulated by

- Type of occupant
- Type of department

TABLE 37

NUMBER OF FTE STAFF WHO CURRENTLY REQUIRE OFFICE SPACE

(1) Type of Department	(2) Type of Occupant	(3) Number of FTE Staff
Academic	FTE Administrator	7.0
	FTE Professional	123.0
	FTE Graduate Assistant	5.8
	FTE Clerical	18.0
Subtotal	N/A	153.8
Nonacademic	FTE Administrator	5.0
	FTE Professional	18.0
	FTE Clerical	35.0
Subtotal	N/A	58.0
TOTAL	N/A	211.8

---

*Summation of offices, conference rooms, office service, and conference room service.

3. Establish as a matter of institutional policy allowances of average Assignable Square Feet required per FTE staff.

► Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

Assignable Square Feet* required per FTE staff requiring office space = 170 ASF/FTE staff**

4. Determine the existing office and office related facilities requirements.

Assignable Square Feet Required = Total FTE staff requiring office space × Assignable Square Feet required per FTE staff requiring office space

= (211.8) × (170)

= 36,006 ASF

5. Compare current requirements for office and office related facilities with available facilities.

TABLE 38

COMPARISON OF CURRENT REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES WITH AVAILABLE FACILITIES

(1)	(2)	(3)	(4)
Item	Current Requirement	Facilities Available	Difference (4)=(3)—(2)
Number of Assignable Square Feet	36,006	26,132	—9,874

Obviously there is not adequate space, which lack strongly suggests the need for a more calculated analysis (see Section 2.1.1 in this manual) in order to determine the nature of the insufficiency.

---

*Includes office, office service, conference room, and conference room service areas.

**This allowance is illustrative only and not recommended as a standard.

Section 2.2.2

General Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR A NEW INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Number of Assignable Square Feet of office and office related facilities required

PROGRAM DATA REQUIRED

►Number of FTE staff who will require office space tabulated by

- Type of occupant
- Type of department*

FACILITIES DATA REQUIRED

►None

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

PROCEDURE

1. Obtain the program data concerning the requirements for office facilities.

   ►Number of FTE staff who will require office space tabulated by

   - Type of occupant
   - Type of department

2. Establish as a matter of institutional policy allowances of average Assignable Square Feet required per FTE staff.

   ►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

   It should be emphasized that use of the term "office and office related facilities" implies the inclusion of allowances not only for work Station needs, but also for office service, conference room, and conference room service needs as well. Use of a factor which is not adjusted in this way will result in a misleading evaluation of current requirements.

   It is important to remember when these allowances are established that they are not design allowances and, also, that they must include consideration of needs for all types of office and office related facilities.

3. Determine the office and office related facilities requirements.

   This determination is made by multiplying the allowance established in step 2 by the number of persons summarized in step 1.

---

*Academic or nonacademic

Section 2.2.2

General Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR A NEW INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

►Number of Assignable Square Feet of office and office related facilities required

PROCEDURE

1. Obtain the program data concerning the requirements for office facilities.

►Number of FTE staff who will require office space tabulated by

- Type of occupant
- Type of department

TABLE 39

NUMBER OF FTE STAFF WHO WILL REQUIRE OFFICE SPACE

(1) Type of Department	(2) Type of Occupant	(3) Number of FTE Staff Who Will Require Office Space
Academic	Administrator	8.0
	Professional	158.0
	Graduate Assistant	15.0
	Clerical	35.5
Subtotal	N/A	216.5
Nonacademic	Administrator	7.0
	Professional	21.0
	Clerical	40.0
Subtotal	N/A	68.0
TOTAL	N/A	284.5

2. Establish as a matter of institutional policy allowances of average Assignable Square Feet required per FTE staff.

►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

Assignable Square Feet* Required per FTE staff requiring office space = 170 ASF/FTE staff**

---

*Includes office, office service, conference room, and conference room service areas.

**This allowance is illustrative only and not recommended as a standard.

3. Determine the office and office related facilities requirements.

$$\text{Assignable Square Feet Required} = \begin{array}{l}\text{Total FTE staff}\\ \text{requiring office}\\ \text{space}\end{array} \times \begin{array}{l}\text{Assignable Square}\\ \text{Feet required per}\\ \text{FTE staff requiring}\\ \text{office space}\end{array}$$

$$= (284.5) \times (170)$$

$$= 48{,}365 \ \text{ASF}$$

Section 2.2.3

General Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR AN EXISTING INSTITUTION

DISCUSSION

DATA TO BE DETERMINED

►Number of additional Assignable Square Feet of office and office related facilities required

PROGRAM DATA REQUIRED

►Number of FTE staff who will require office space tabulated by

- Type of occupant
- Type of department*

FACILITIES DATA REQUIRED

►Number of Assignable Square Feet in existing office and office related facilities

UTILIZATION ASSUMPTIONS REQUIRED

►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

PROCEDURE

1. Obtain the required facilities data.

   ►Number of Assignable Square Feet in existing office and office related facilities

2. Obtain the program data concerning the requirements for office facilities.

   ►Number of FTE staff who will require office space tabulated by

   - Type of occupant
   - Type of department

3. Establish as a matter of institutional policy allowances of average Assignable Square Feet required per FTE staff.

   ►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

   It should be emphasized that use of the term "office and office related facilities" implies the inclusion of allowances not only for work Station needs, but also for office service, conference room, and conference room service needs as well. Use of a factor which is not adjusted in this way will result in a misleading evaluation of current requirements.

   It is important to remember when establishing these allowances that they are not design allowances and, also, that they must include consideration of needs for all types of office and office related facilities.

---

*Academic or nonacademic

4. Determine the office and office related facilities requirements.

   This determination is made by multiplying the allowance established in step 2 by the number of persons summarized in step 1.

5. Compare the projected requirements for office and office related facilities with available facilities.

COMMENTS ON THE PROCEDURE

As with all general methods, the technique is based on several simplifying assumptions, and, therefore, has numerous limitations.

First, while number of Stations should be a more accurate indicator of current capacity than area, there is considerable difficulty associated with arriving at this number. It is impossible to specify an exact or optimum number of Stations in a particular room since this number varies as a function of the user of the room. The same room might accommodate one department chairman or two clerical employees or three graduate assistants. Specifically, the generalized assumption must be that all rooms will continue to be occupied by employees of the same type as the current occupants and the projection will be based on area requirements rather than number of Stations or number of offices. To obviate the restrictions imposed by this assumption, a review of assignments on a room-by-room basis is required, revising them where necessary. The amount of effort and the level of detail associated with this process are inconsistent with the objectives of a general methodology. Therefore, for quick estimation purposes, it is suggested that not only the simplifying assumptions about use of current space be accepted, but also that the limitations be recognized.

Second, the very important consideration of physical location of office space is ignored. Departmental considerations are neglected except for the distinction between academic and nonacademic departments. The inefficiencies of space assignment which develop because it is difficult to house a clerk from the registrar's office at the empty desk in the treasurer's office or to assign the chemistry faculty member space in the midst of the archeologists are not recognized in projecting needs for office space. Such considerations cannot be taken into account except through use of the detailed methodology described previously.

Section 2.2.3

General Method

PROJECTION OF REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES FOR AN EXISTING INSTITUTION

EXAMPLE

DATA TO BE DETERMINED

►Number of additional Assignable Square Feet of office and office related space required

PROCEDURE

1. Obtain the required facilities data.

►Number of Assignable Square Feet in existing office and office related facilities

Number of Assignable Square Feet in existing office and office related facilities* = 26,132 ASF

2. Obtain the program data concerning the requirements for office facilities.

►Number of FTE staff who will require office space tabulated by

- Type of occupant
- Type of department

TABLE 40
NUMBER OF FTE STAFF WHO WILL REQUIRE OFFICE SPACE

(1) Type of Department	(2) Type of Occupant	(3) Number of FTE Staff Who Will Require Office Space
Academic	Administrator Professional Graduate Assistant Clerical	8.0 158.0 15.0 35.5
Subtotal	N/A	216.5
Nonacademic	Administrator Professional Clerical	7.0 21.0 40.0
Subtotal	N/A	68.0
TOTAL	N/A	284.5

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*Summation of offices, conference rooms, office service areas, and conference room service areas.

3. Establish as a matter of institutional policy allowances of average Assignable Square Feet required per FTE staff.

►Average number of Assignable Square Feet of office and office related facilities required per FTE staff requiring office work space

Assignable Square Feet* required per FTE staff required office space = 170 ASF/FTE staff**

4. Determine the office and office related facilities requirements.

Assignable Square Feet Required = Total FTE staff requiring office space × Assignable Square Feet required per FTE staff requiring office space

= (284.5) × (170)

= 48,365 ASF

5. Compare the project requirements for office and office related facilities with available facilities.

TABLE 41

COMPARISON OF PROJECTED REQUIREMENTS FOR OFFICE AND OFFICE RELATED FACILITIES WITH AVAILABLE FACILITIES

(1)	(2)	(3)	(4)
Item	Projected Requirement	Facilities Available	Difference (4)=(2)−(3)
Number of Assignable Square Feet	48,365	26,132	22,233

The results indicate that a near doubling of current office and office related space is required to meet projected needs. This inadequacy strongly suggests the need for a more detailed projection of office requirements (see Section 2.1.3 in this manual).

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*Includes office, office service, conference room, and conference room service areas.

**This allowance is illustrative only and not recommended as a standard.

Section 2.3.

OFFICE AND OFFICE RELATED FACILITIES UNIT FLOOR AREA CRITERIA

ROOM TYPES

Offices, office service areas, conference rooms, conference room service areas

DISCUSSION

Office unit floor area criteria tabulated by

- ►Type of occupant
- ►Degree of privacy
- ►Type of department

Table 42 displays unit floor area criteria which have been developed in terms of Assignble Square Feet per office or per Station as indicated. The ranges in the values allow or distinctions to be made on the basis of professional level, where this is the practice.

TABLE 42

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE WORK STATIONS

(1)		(2)	(3)	(4)	(5)
		Academic Departments		Nonacademic Departments	
Personnel Category		Single Occupancy ASF/Station	Multiple Occupancy ASF/Station	Single Occupancy ASF/Station	Multiple Occupancy ASF/Station
Administrator —	President	N/A	N/A	300 ± 50	N/A
	Vice-Pres.	N/A	N/A	240 ± 30	N/A
	Dean	240 ± 20	N/A	N/A	N/A
	Chairman	180 ± 20	N/A	N/A	N/A
Professional		120 ± 10	90 ± 10	120 ± 20	90 ± 10
Secretarial-Clerical		120 ± 10	90 ± 20	120 ± 40	90 ± 20
Graduate Assistants		N/A	50 ± 10	N/A	N/A

DISCUSSION

Office service space unit floor area criteria tabulated by

- ►Size of department
- ►Extent of (record/office supply) storage

Table 43 displays unit floor area criteria for service as percentages of office space. The criteria are given in ranges of size of department, determined by the number of work tations to allow for differences in operational style as well as institutional policy.

TABLE 43

ASSIGNABLE SQUARE FEET CRITERIA FOR OFFICE SERVICE FACILITIES FOR A NEW INSTITUTIO

(1)	(2)	(3)
Department by Size (FTE Staff Requiring Office Work Stations)	Assignable Square Feet of Service Space per Department	
	Academic Departments	Nonacademic Departments
0 — 5	150 ± 25	150 ± 50
6 — 10	200 ± 25	200 ± 50
11 — 20	250 ± 25	250 ± 50
21 — 30	300 ± 25	300 ± 50
31 and above	350 ± 25 +5 ASF per each FTE staff over 30	350 ± 50 +5 ASF per each FTE staff over 30

DISCUSSION

Conference room unit floor area criteria tabulated by

►Number of Stations

Table 44 is a tabulation of suggested design criteria for conference rooms. It is assumed that conferences attended by more than 30 persons will be held in classrooms or lecture halls. Conference room service requirements typically do not vary much from conference room to conference room.

TABLE 44

ASSIGNABLE SQUARE FEET CRITERIA FOR CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES

	Conference Room Assignable Square Feet per Station	
Stations	Assignable Square Feet per Station	Conference Room Service Space in Assignable Square Feet
10	25	30 ± 5
15	22	30 ± 5
20	20	30 ± 5
25	20	30 ± 5
30	15	30 ± 5

Section 3.

RESEARCH AND GRADUATE TRAINING FACILITIES

ROOM TYPES INCLUDED

onclass laboratories and related service areas

DISCUSSION

onclass laboratories normally house research and graduate training activities. Un-rtunately for the planner, these activities are not confined to nonclass laboratories or are the uses of nonclass laboratories confined to research and graduate training ctivities. As a result, the processes of estimating future demands for space to house ese activities are lacking in precision and certainty. In an effort to put the require-ents for nonclass laboratories in perspective, the factors which contribute to this ncertainty are discussed in the following paragraphs.

irst, there is no well-defined group of users of research space. Typically, they are a ixture of faculty members, students, technicians, and other support employees, the umber of which may depend on economic or funding considerations.

cond, in addition to nonclass laboratories these users are accommodated within a riety of room types. Much research activity is carried on in offices and libraries d an increasing amount is being conducted in data-processing facilities.* Designa-on of the predominant departments in which the research is being done is a necessary t not a totally sufficient determinant for establishing requirements for research space. hile it is generally true that engineering, agriculture, and the biological and physical iences require more space for research activities than do most other types of depart-ents, interests within almost every department have broadened to the point where ey no longer are oriented strictly toward offices and/or libraries. In almost all de-rtments there are individuals who are interested in the discovery of experimental pects of the research area who require laboratory research space, and there are those volved in the theoretical aspects who use office and library research facilities. Care ust be taken to avoid accounting for the same space need twice. It is possible, for ample, to generate both office space and nonclass laboratory space on the basis of a ngle requirement for research space. This type of mistake can be avoided by properly counting for the requirements and generated space.

hird, the element of time is not a consideration in the determination of research space eds. The proportion of an individual's time which is devoted to research activities is obably much less of a consideration in determining the necessary research space than he mere fact of his involvement. The nature of research activities is such that, if an dividual engages in research activities at all, an incremental amount of space (often significant proportions) must be made available to him. As the percentage of an dividual's effort which is devoted to research increases, the amount of space required ay also increase, but, in all probability, at a less than proportionate rate. A full-time search staff member will seldom require as much space as four one-quarter-time re-rch faculty members in the same department.

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ield Service Facilities, although not classified as nonclass laboratories, are basically research ace. However, they are such special facilities that they are not included in these considerations.

Finally, research activities basically are not people-oriented; research facilities are primarily equipment oriented. Some minimum area which is required to provide a individual with nothing more than benchtop work space can be defined as a matter c architectural consideration and human engineering. This minimum area is probably of the order of 55-70 square feet. Any space required by an individual which is in excess of this minimum amount is a function of the equipment that individual uses in his research work. The space needs generated by such equipment vary drastically, no from department to department, but from project to project and from individual t individual. At the extreme, the space needed to house a single major piece of equipment may fill a complete building (as, for example, a building which houses an accelerator). At the other extreme, the additional space requirements may be limited t a very few square feet.

Not only do research space requirements vary widely, but they change continuously As technology changes, the amount of space required to perform the same tasks ma change also. The very nature of the research activity requires that such changes occur Moreover, research projects typically are associated with the individual rather tha with the institution. When that person moves, the research project goes with him Therefore, the existence of a continuously changing technology and the lack of permanence of research projects emphasizes the need for well planned, flexible resear facilities. It would be a great mistake to construct expensive, massive spaces to accommodate changing requirements. Less expensive, even temporary quarters may offer th most comfortable accommodations for research type needs.

In light of these wide variations and changing conditions, it is obvious that the detaile determination and projection of nonclass laboratory space needs is impossible. At best the planner can hope only to calculate or to approximate the total amount of suc space which will be required on a department by department basis at some point in th future. For such purposes, rules of thumb can be developed.

The detailed planning process is a meaningless exercise until such time as programmin for a new building is actually begun. At that time there is reason and need to determin specific requirements for specific projects and for identified research activities within th department(s) for which additional space is to be provided.

Section 3.1.

Detailed Method

PROJECTION OF REQUIREMENTS FOR RESEARCH AND GRADUATE TRAINING FACILITIES

INTRODUCTORY COMMENTS

In actuality there is no detailed method for generating estimates of nonclass laboratory requirements. Although the general method (which yields the total nonclass lab space required for each department) leaves something to be desired, it is practically the only echnique available which is less than a full scale, room-by-room, building program statement for all such facilities.

The absence of detailed methodologies for research space accurately reflects the realities and practicalities of the situation. In general, long-term planning requires nothing more han generalized results which the general method yields. Short-term management or management of space within a time frame too short to allow solution of problems by simple expedient of adding space is accomplished in reaction to specific needs of particuar projects. As a result, the detailed method which is associated with nonclass laboraories has little application except in conjunction with a construction program. Accordingly, planning in detail for research space is accomplished only for a few selected departments at any one time.

Since the detailed planning process is so closely tied to building programming, it results n a very explicit plan. In addition, the process by which such plans are developed is considerably different in many respects than the processes used for other types of acilities.

A department's need for additional nonclass laboratory space can be made evident in everal ways. The general method is particularly useful in isolating those departments which project marked excesses or deficiencies of space. By determining the needs which cannot be alleviated by reallocation of space, a basic list of additional research laboraory requirements can be established. Similarly, departments which will have inufficient laboratory space to carry out their research activities can be identified on the basis of present shortages compounded by projections of an expansion of such activities. Under such conditions, obvious, current space management problems or vocal faculty members will aid in pinpointing the departments which are operating with less than he required amount of nonclass laboratory space. Reliance on the latter technique has he advantage of simplicity. On the other hand, it also has the overriding disadvantage of responding to problems only after they have become fully visible. Regardless, as a esult of either the political or the generalized planning processes of an institution, urther detailed planning of the nonclass laboratory needs in selected departments will e indicated. No attempt will be made to describe each of the steps in this process; it aries so greatly from institution to institution that any such attempt is foredoomed to ailure. Instead, the following paragraphs will attempt to describe the spirit and the avor of the process.

The detailed determination of nonclass laboratory requirements is probably more heavily dependent on user input than is the planning of any other type of space. Th faculty member whose equipment and activities are to be accommodated within a laboratory plays the major role in determining the physical characteristics (including size) of the laboratory. Although architects and institutional facilities planners with no faculty involvement may be competent to design general classrooms, faculty offices, and many class laboratories with a minimum amount of direction, they cannot serve the same purpose in planning specialized research facilities. If such facilities are to serve adequately the purposes for which they were intended, the user must be consulted thoroughly during the planning process.

This dependence on the faculty member for guidance has several ramifications. First, it very often results in an interesting bit of by-play between the faculty member and the administrators charged with controlling project costs. Because there are no reliable yardsticks available by which one can identify excessive requests, planning a specific laboratory rapidly becomes an exercise in large group negotiation. Facilities limitations are drawn on the basis of funding availability; space planning is carried on within these limitations. Conflicting demands for limited dollars may tend to insure that in the end the detailed plans do not result in drastic excesses or shortages in any given laboratory or group of laboratories.

A more serious ramification of this method of facilities planning is the shortened time horizon for which the resulting plans are applicable. Such planning tends to reflect the needs of current or near-term research projects to the exclusion or detriment of long range needs. In cases in which the planning takes expanding or changing needs into consideration, these needs are the first ones to be abandoned in the face of funding limitations. Although this often results in a facility which rapidly becomes functionally obsolete, there is considerable doubt that the process can be improved significantly and its disadvantages eliminated. As long as the activities housed within these facilities are by definition change oriented, there must be an expectation of continually changing facilities needs.

The end result of the detailed planning process for nonclass laboratories and related service areas is a room-by-room specification of size and other physical characteristics of the laboratories required to fulfill the needs of a specific department or group of departments.

Section 3.2.

General Method

PROJECTION OF REQUIREMENTS FOR RESEARCH AND GRADUATE TRAINING FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- ►Assignable Square Feet of research space required tabulated by department

PROGRAM DATA REQUIRED

- ►Projected number of head count faculty engaged in research tabulated by department
- ►Projected number of head count graduate students engaged in research tabulated by department

FACILITIES DATA REQUIRED

- ►Nonclass laboratory facilities, tabulated by department

UTILIZATION ASSUMPTIONS REQUIRED

- ►Average Assignable Square Feet per head count faculty engaged in research tabulated by department
- ►Number of head count graduate students to be accommodated in the Assignable Square Feet provided for each faculty member
- ►Average Assignable Square Feet per graduate student engaged in research in excess of the stated limit

PROCEDURE

1. Obtain the required program data concerning persons involved in research.

- ►Projected number of head count faculty engaged in research tabulated by department
- ►Projected number of head count graduate students engaged in research tabulated by department

This type of information can be found through the use of the program planning procedures contained in Manual Six.

The general method is based on the proposition that an individual's requirement for research space is dependent on his mere involvement in research, rather than on the extent of his involvement, and that the amount of space required varies by discipline. Use of this technique allows the planner to *approximate* the total nonclass laboratory needs associated with each of the academic departments. This method is based on broad (averaged) factors and is not sensitive to the large number of variations which occur from project to project.

2. Obtain the required facilities data.

- ►Nonclass laboratory facilities tabulated by department

3. Establish as a matter of institutional policy allowances of Assignable Square Fee for those persons engaged in research.

   - ►Average Assignable Square Feet per head count faculty engaged in research tabulated by department
   - ►Number of head count graduate students to be accommodated in the Assignabl Square Feet provided for each faculty member
   - ►Average Assignable Square Feet per graduate student engaged in research in excess of the stated limits

   Implicit in these policy decisions is a recognition of the fact that a substantia amount of this type of space is required to permit a faculty member* to engage i research. Once this amount of space has been provided, a limited but specifi number of graduate students can be accommodated with no increase in space.

   However, for each additional graduate student in excess of these stated limits, a additional, incremental amount of research space is required.

   Although these allowances are couched in terms of nonclass laboratory facilities they should be designed to include all types of research space unless accounted fo in some other way. For example, in some cases it is easier to make allowances fo research space by allowing for a larger office (see Section 2. in this manual).

4. Determine the research facilities requirements.

   This determination is the mathematical product of the allowances established i research. Care must be exercised to account properly for the step function manne in which the space is to be projected.

5. Determine the additional amount of research facilities required.

   Simply subtract the existing Assignable Square Feet of research space from the projected amount to determine additional facilities requirements.

COMMENTS ON THE PROCEDURE

The techniques outlined above help to establish general research facilities requirement before any monies are granted. Special equipment needs must be established separately Moreover, as stated previously, when the time comes that research grants have bee awarded and specific needs must be met, the problem becomes one of detailed spac management and political negotiation. That process is unique to each institution.

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*The term faculty in this instance is meant to exclude teaching, research, and other types of graduate assistants whose numbers are to be accounted for in the graduate student category. Individual engaged in postdoctoral types of research activities should be treated as if they were faculty.

Section 3.2.

General Method

PROJECTION OF REQUIREMENTS FOR RESEARCH AND GRADUATE TRAINING FACILITIES

EXAMPLE

DATA TO BE DETERMINED

► Assignable Square Feet of research space required tabulated by department

PROCEDURE

1. Obtain the required program data.

►Projected number of head count faculty engaged in research tabulated by department

►Projected number of head count graduate students engaged in research tabulated by department

TABLE 45

PROJECTED NUMBERS OF FACULTY AND GRADUATE STUDENTS ENGAGED IN RESEARCH

(1)	(2)	(3)
Department	Number of Head Count Faculty Engaged in Research	Number of Head Count Graduate Students Engaged in Research
Biology Department	4	4
Zoology Department	3	5
Mathematics Department	5	7
Chemistry Department	6	6
Geology Department	2	2
Physics Department	6	3
Fine Arts Department	8	8
Philosophy Department	4	4
Political Science Department	6	8
History Department	5	6
Economics Department	4	3
Psychology Department	2	1
TOTAL	55	57

2. Obtain the facilities data.

►Nonclass laboratory facilities tabulated by department

TABLE 46

INVENTORY OF NONCLASS LABORATORY FACILITIES

(1) Department	(2) Assignable Square Feet of Nonclass Laboratory Facilities*
Biology Department	2,150
Zoology Department	830
Mathematics Department	823
Chemistry Department	5,675
Geology Department	1,326
Physics Department	5,160
Fine Arts Department	1,266
Philosophy Department	200
Political Science Department	222
History Department	222
Economics Department	244
Psychology Department	645
TOTAL	18,763

*Does not include office facilities which are devoted to research.

3. Establish as a matter of institutional policy allowances of Assignable Square Feet for those persons engaged in research.

   ►Average Assignable Square Feet per head count faculty engaged in research tabulated by department
   ►Number of head count graduate students to be accommodated in the Assignabl Square Feet provided for each faculty member
   ►Average Assignable Square Feet per graduate student engaged in research in excess of the stated limit

TABLE 47

ALLOWANCES OF ASSIGNABLE SQUARE FEET FOR PERSONS ENGAGED IN RESEARCH*

(1) Department	(2) Average Assignable Square Feet per Head Count Faculty Engaged in Research	(3) Number of Head Count Graduate Students to be Accommodated in ASF in Column (2)	(4) Average Assignable Square Feet per Graduate Student Engaged in Research in Excess of Limit Stated in Column (3)
iology Department	900-1,300	4	200-250
oology Department	900-1,300	4	200-250
athematics Department	150- 200	4	20- 25
hemistry Department	900-1,300	4	200-250
eology Department	900-1,300	4	200-250
hysics Department	900-1,300	4	200-250
ine Arts Department	600- 900	4	150-200
hilosophy Department	150- 200	4	20- 25
olitical Science Department	150- 200	4	20- 25
istory Department	150- 200	4	20- 25
conomics Department	150- 200	4	20- 25
sychology Department	600- 900	4	150-200

The values in Table 47 are illustrative only and are not to be interpreted as standards.

4. Determine the research facilities required.

TABLE 48

REQUIREMENTS FOR RESEARCH FACILITIES IN ASSIGNABLE SQUARE FEET

(1) Department	(2) Number of Head Count Faculty Engaged in Research	(3) ASF per Head Count Faculty Engaged in Research	(4) Assignable Square Feet (4)=(2)x(3)	(5) Number of Head Count Graduate Students Engaged in Research in Excess of Limit*	(6) ASF per Head Count Graduate Students Engaged in Research in Excess of Limit	(7) Assignable Square Feet (7)=(5)x(6)	(8) Total Assignable Square Feet in Research Space** (8)=(4)+(7)
Biology Department	4	1,200	4,800	0	230	0	4,800
Zoology Department	3	1,200	3,600	1	230	230	3,830
Mathematics Department	5	200	1,000	3	20	60	1,060
Chemistry Department	6	1,300	7,800	2	250	500	8,300
Geology Department	2	1,000	2,000	0	220	0	2,000
Physics Department	6	1,300	7,800	0	250	0	7,800
Fine Arts Department	8	650	5,200	4	175	700	4,700**
Philosophy Department	4	150	600	0	20	0	600
Political Science Dept.	6	150	900	4	20	80	980
History Department	5	150	750	2	20	40	790
Economics Department	4	160	640	0	22	0	640
Psychology Department	2	600	1,200	0	170	0	800**
TOTAL	55	N/A	36,290	16	N/A	1,610	36,300

*Obtained by subtracting the limits suggested in column (3) of Table 47 from the number of graduate students engaged in research in column (3) of Table 45.

**Research space which has been accounted for in procedures for determining office space has been subtracted from the totals in this column.

5. Determine the additional amount of research facilities required.

TABLE 49

ADDITIONAL REQUIREMENTS FOR RESEARCH FACILITIES

(1) Department	(2) Assignable Square Feet in Current Facilities	(3) Assignable Square Feet in Projected Facilities Requirements	(4) Assignable Square Feet Additional Facilities Required (4)=(3)−(2)
Biology Department	2,150	4,800	2,650
Zoology Department	830	3,830	3,000
Mathematics Department	823	1,060	237
Chemistry Department	5,675	8,300	2,625
Geology Department	1,326	2,000	674
Physics Department	5,160	7,800	2,640
Fine Arts Department	1,266	4,700	3,434
Philosophy Department	200	600	400
Political Science Department	222	980	758
History Department	222	790	568
Economics Department	244	640	396
Psychology Department	645	800	155
TOTAL	18,763	36,300	17,537

Section 3.3.

RESEARCH FACILITIES

UNIT FLOOR AREA CRITERIA

ROOM TYPES Nonclass laboratories, nonclass laboratory service areas

DISCUSSION Commonly published figures for Research Space such as Assignable Square Feet per researcher or Assignable Square Feet per academic FTE are valid usually for planning purposes but have little relevance for the actual configuration of a research space. Generally the area of a research laboratory is a function of the equipment necessary for the operation. However, it would be misleading as well as extremely difficult to tabulate unit floor area criteria for research laboratories on the basis of equipment allowances. There are virtually no universally applicable design criteria for research space. It is suggested that planning criteria be used to project future research space needs. However, current research space requirements will need to be determined on the basis of the individual project needs. Most often these needs will be functions of the equipment rather than the people involved.

HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

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MANUAL FOUR

ACADEMIC SUPPORT FACILITIES

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Section 1.

Introduction

ACADEMIC SUPPORT FACILITIES

Manual Four of the *Higher Education Facilities Planning and Management Manuals* describes the procedures for evaluating the use of and projecting the need for

1. Study facilities (libraries)
2. Museum, gallery, and other exhibition facilities
3. Audio/visual facilities
4. Computing facilities

These types of facilities are grouped in this way to correspond to the Academic Support subprograms of the WICHE *Program Classification Structure,* Preliminary Edition, 1970.* In general, the Academic Support subprograms entail functions which have similar objectives and purposes: acquisition, preservation, maintenance, transformation, retrieval, interpretation, and display of recorded knowledge and information. Moreover, the activities of each of these subprograms require a distinctive type of facility. In varying degrees, however, each of the above types of facilities are required to accommodate the following functions:

►Acquisition and preservation of the media by which information is recorded

The media include printed materials and manuscripts, works of art, artifacts, natural objects, motion pictures, video tape, photographs, slides, microform, audio recordings, punched cards, and data recorded in electromagnetic form.

►Use of the media by students, faculty, staff, and the public

User facilities range from reading tables, listening booths, microform readers, and study carrels to art gallery concourses, television sets, keypunch machines, and computer terminals. In most cases, provision is made for the user facilities in close conjunction with the media, material, or equipment needed. Increasingly, remote terminals, television, and facsimile reproduction devices permit the physical separation of the user and the original stored materials. However, only certain types of media can be retrieved economically by remote access.

►Services and management of academic support operations

The acquisition, processing, cataloging, and maintenance of the media require staff offices, other working facilities, and space for specialized equipment. User advisory services and the processes of location, retrieval, utilization, and reproduction of media resources for the user also require staff offices, work areas, and specialized equipment. In addition, the maintenance of the equipment used for processing, retrieval, and reproduction of the stored information may create the need for sub-

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*A fifth subprogram under the Academic Support program in the *Program Classification Structure* is "Ancillary Support," e.g., laboratory schools and teaching hospitals. These types of facilities associated with the Ancillary Support subprogram are not dealt with in this manual.

stantial space in an academic support facility, such as an audio/visual center. Finally, the managerial functions of the academic support operation require office facilities.

In spite of these general similarities of function, libraries, museums and galleries, audio/visual services, and computing services vary widely in the nature of their facilities requirements. Nevertheless, the form of evaluation and projection of these academic support facilities generally involves consideration of the

- ►Materials to be displayed and stored
- ►Users to be served
- ►Staff to be accommodated
- ►Special equipment requirements not accounted for in the storage, user, or staff service components

In the following sections, the methods for evaluating the capacity of existing facilities and for projecting future requirements will follow this general form.

Section 2.

LIBRARY FACILITIES

INTRODUCTORY COMMENTS

ROOM TYPES INCLUDED

Study room, stack room, open-stack reading room, library processing room,* and study facilities service*

DISCUSSION

In size, content, scope of functions, and specialization of services, the range of variance among libraries is as great as the range of program characteristics among colleges and universities of various types and sizes. It is useful to think of the size and content of the library as being generally associated with the size and composition of the academic programs of the institution. However, some long-established liberal arts colleges have more extensive and comprehensive libraries than many larger and newer public universities.

Typically, planning and evaluation procedures for library facilities must consider at least three types of library operations and services.

- ►Library Collections
- ►User Facilities
- ►Library Staff and Service Facilities

These three operations all have specific implications for facility requirements which will be discussed in the following paragraphs.

1. Library Collections

The size of library collections in an existing institution is a function of historical development as well as of the rates of acquisition and removal over time. Projections of the growth of collections depend upon

- ►The resources that will be available to the institution for acquisitions
- ►The costs of acquiring and processing new materials
- ►The costs of removing obsolete material

On the continuum which extends from the community college with a strong vocational-technical orientation emphasizing textbook instruction to the long-established university research library, rates of acquisition of library materials will range from a few hundred to over 200,000 volumes per year. The scope of subject matter and level of specialization of acquisitions will vary accordingly.

A variety of quantitative formulas has been put forth as a basis for gauging the "threshold" adequacy of size of library collections according to student population and composition, numbers of undergraduate and graduate degree programs, faculty size, and similar factors. A number of states use the formula developed by Clapp and Jordan as a basis for judging the minimum size of a college library. A modification of the Clapp-Jordan formula was developed by institutions in the state of

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*In addition, office and office service facilities of the organization unit, library, are included in both the detailed and general planning methods described in this manual.

Washington as part of a budget formula for libraries. The Association of College and Research Libraries, a division of the American Library Association, has published quantitative criteria for minimum size of collections based on enrollment size for college libraries and junior college libraries.*

The library profession generally agrees that these quantitative formulas for evaluating the minimum size of library collections are unsatisfactory. One major objection is that both the Clapp-Jordan and Washington formulas include factors for the minimum number of volumes required for the number of degree programs offered, graduate and undergraduate. For example, both formulas use a value of 24,500 volumes for every doctoral degree program offered. Such a value, even if it were a valid average, obscures the enormous differences between academic fields of study in terms of their reliance on library materials and the scope of collections needed to support a given field of study. Similarly, the use of the size of student enrollments as a factor for estimating the number of volumes needed obscures differences in the nature of the student characteristics and academic programs of different institutions. While such formulas may be useful as a starting point for estimating the minimal essential size of a library collection for a given institution, especially a new one, they should not be applied to all types of institutions without careful evaluation of library needs in terms of the nature and composition of the instruction and research programs of each individual institution.

Ideally, the determination of the desirable size of a given library collection should be based on a detailed bibliographic evaluation of each subject field in relation to the academic program characteristics of each field of study offered by the institution. This must be a continuing process involving systematic communication between the professional librarians, faculty, students, and administration of the institution. The projection of future growth of the collections will depend upon a variety of factors, such as the inadequacy or obsolescence of collections in certain fields, the expected development of new programs that will require the acquisition of essential basic materials in the field, the expected modifications in instructional techniques, the differential rates of literature production in the different fields with which the library should keep abreast, and, of course, the expected resources that will be available for library acquisitions.**

As a practical matter in terms of planning library facilities requirements, the growth of library collections usually must be projected on the basis of some rule-of-thumb factor, such as an average annual percentage increase in the numbers of volumes

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*Verner W. Clapp and Robert T. Jordan, "Quantitative Criteria for Adequacy of Academic Library Collections," *College and Research Libraries,* 26 (September 1965): 371-375; (Washington) The Interinstitutional Committee of Business Officers, *A Model Budget Analysis System for Program 05, Libraries* (Olympia, Washington: Office of Interinstitutional Business Studies, October 1968); Association of College and Research Libraries, Committee on Standards, "ALA Standards for College Libraries," *College and Research Libraries,* 20 (July 1959): 274-280; and "Standards for Junior College Libraries," *College and Research Libraries,* 21 (May 1960): 200-206. The ALA-ACRL standards currently are being revised. It should be noted that in this edition of Manual Four the point of view taken toward size-of-collection formulas is considerably different from that in the original Field Review Edition. The authors are especially indebted to Stephen A. McCarthy, Executive Director of the Association of Research Libraries, for mobilizing constructive criticism of the Field Review Edition from the library profession which has resulted in many improvements. The content of this edition, however, remains the responsibility of the principal investigator of the project and does not necessarily carry the official endorsement of any professional organization.

**See H. H. Fussler and J. L. Simon, *Patterns in the Use of Books in Large Research Libraries* (Chicago: University of Chicago Press, 1961). Recent applications of systems analysis to libraries show promise of providing a stronger base for estimating library requirements; see Philip M. Morse, *Library Effectiveness: A Systems Approach* (Cambridge: Massachusetts Institute of Technology Press, 1968); and Jeffrey A. Raffel and Robert Shishko, *Systematic Analysis of University Libraries: An Application of Cost-Benefit Analysis to the M.I.T. Libraries* (Cambridge: Massachusetts Institute of Technology Press, 1969).

and other units of material to be acquired and removed annually. Projections of the anticipated dollar resources available for acquisitions divided by an expected average unit cost of acquisitions to determine annual acquisition rates could be used if resource and cost factors could be reasonably estimated.

A major problem that the library planner faces is the definition of the contents of a library collection and the quantitative measures of these collections. A "volume" may take many forms. Books, microforms, maps, recordings, government documents, periodicals and other serials, and special collections of manuscripts and papers vary significantly in the forms in which they are shelved and stored. For purposes of projecting and evaluating facilities needs, some institutions convert these types of materials into "volume equivalents" related to stack and storage space requirements.* Because of the difficulty of standardizing units of library collection items, spatial measures (such as lineal feet of material shelved or numbers of single- or double-face standard stack sections of material) are the best measures of quantities of library collections for facilities planning and evaluation.

The 1971 Higher Education General Information Survey (HEGIS VI) uses the following categories of library resources:

- ►Number of volumes, exclusive of volumes on microform
- ►Number of printed government documents not reported as volumes
- ►Number of reels of microfilm
- ►Number of physical units of other microform
- ►Number of periodical titles, excluding duplicates

The HEGIS definition of volume is "a physical unit of any printed, typewritten, handwritten, mimeographed, or processed work contained in one binding or portfolio, hardbound or paper bound, which has been classified, cataloged, and/or made ready for use." Bound periodical volumes may be included in the volume count, but this is not yet clearly standardized. Since HEGIS is the national reporting vehicle for library collections, its categories are most useful as a basis for evaluation and projection of library collections.

A more detailed breakdown of types of material by type of stack or other storage units may be desirable. Also an alternative, but less satisfactory approach, is simply to count only bound volumes. Measurement units may be in terms of volumes and other physical units, lineal feet of shelved material, or numbers of filled single- or double-face stack sections. These measures can be converted into each other and into Assignable Square Feet of floor area.**

It should be noted that, in reality, any measure of volumes per Assignable Square Foot is subject to a considerable variance and should be recognized as being some kind of average and in part hypothetical. The degree to which stack shelving can be packed without incurring operational inefficiencies also is a matter of debate. If

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*See Harlan D. Bareither and Jerry L. Schillinger, *University Space Planning* (Urbana, Ill.: University of Illinois Press, 1968), pp. 64-66.

**See Keyes D. Metcalf, *Planning Academic Research Library Buildings* (New York: McGraw-Hill, 1965) for a detailed discussion of stack arrangements, esp. p. 53 and Appendix B. For example, the typical single-face section is three feet wide, approximately 10 inches deep, and has seven shelves (21 lineal feet of shelving). If double-face stack sections are ranged on 4'6" centers, with a three-foot transverse aisle between eight-section ranges, then there is an average of 8.33 Assignable Square Feet per single-face section. Assuming an average capacity of, say, six volumes per lineal foot of shelving, a single-face stack section would hold 125 volumes on the average. This works out to an average of 0.067 square foot per volume or 15 volumes per Assignable Square Foot.

collections are densely packed, new acquisitions cannot be added in catalog-numbering sequence without frequent and costly reshelving. Many states have adopted a planning factor of 0.0833 Assignable Square Foot per volume (12 volumes per Assignable Square Foot) as a guideline. However, which library materials are included is not always clearly defined. In some instances, a factor of 0.10 Assignable Square Foot per volume, or 10 volumes per Assignable Square Foot, is used. Generally, however, that factor includes an allowance for either unbound materials and other items not included in the counted "volumes" or for library-service or reader facilities (e.g., stack carrels) for which there is no other explicit allowance.

In recent years much attention has been given to compact storage of little-used but still valuable library materials.* Off-campus compact storage in lower cost facilities has its attractions. However, there is some evidence that the costs of off-campus compact storage are greater than the savings of capital investment which is required to expand normal, central stack storage.** Certainly the operating costs of selecting, removing, recataloging, transporting, retrieving, and returning the materials should be carefully considered before a major move toward remote compact storage is attempted. In some cases, delays in the construction of new library facilities force compact storage irrespective of operating costs.

In planning library capacity, attention needs to be paid to the timing and nature of a planning target year. Because of the almost inevitable delays in new construction, it would be unwise to plan for complete saturation of the stacks at the planning target year. Projection of library requirements to serve at least ten years' collection growth after the completion of new or expanded capacity is not unreasonable, but rates of actual growth may be either greater or less than planned. To avoid excessive compression or costly relocation of materials when stack space approaches capacity, planning target allowances should not be too tight.

In the examples in this manual, the University of California system for measuring library collection quantities and their unit floor area relationships will be used for illustrative purposes.† However, the reader should be aware of the fact that the considerations used in the development of the California System may be inappropriate for the needs and objectives of his particular institution.

2. User Facilities

The number and variety of readers to be accommodated in the library also vary widely with the size and program characteristics of the institution. Many states have adopted a single standard of reader Stations for 25 percent of the Full-Time Equivalent Student enrollment. Such a single, uniform standard obscures the diversity of library use generated by different types of institutional programs as well as by types of readers. At one extreme, the California Community College system uses a formula which decreases the ratio of reader Stations to FTE Students as the proportion of student credit hours taught in trade-technical courses increases. Community colleges with less than three percent trade-technical courses are allowed 20 reader Stations for every 100 FTE, and those with more than 10 percent trade-technical student credit hours are allowed only 15 reader Stations

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*See Ralph E. Ellsworth, *The Economics of Book Storage* (Metuchen, N. J.: Scarecrow Press, 1969).

**See Raffel and Shishko, *Systems Analysis of University Libraries,* Chapter 2.

†University of California, Office of the President, "Planning Guide for Libraries." Mimeographed. May 24, 1968.

per 100 FTE.* At the other extreme, a highly selective private university recently programmed new library facilities to accommodate 40 percent of the undergraduate full-time students, 50 percent of those graduate students for whom primary research resources are housed in the central library, and 10 percent of the part-time students. The high proportion of reader Stations for undergraduates was based on the fact that this university requires very extensive library reading and research in all its undergraduate courses.

The Association of College and Research Libraries recommends that reader Stations be provided for at least one-third of the student body in a four-year liberal arts college and at least one-fourth of the Full-Time Equivalent Students in a community college library.

In developing detailed evaluation and projection of reader Station requirements, an in-depth analysis of the library user population should be made. The existing and projected student population by level of student and field of study, the distribution of existing and projected faculty by discipline and other user demand (e.g., public and professional use) may be used as a basis for judging differential demands placed on library reader facilities. For example, lower division students may be expected to utilize library reader facilities at a lower rate if their courses are more likely to be textbook oriented. Upper division majors in fields placing heavier emphasis on library resources (e.g., the humanities and social sciences) may be assumed to require a higher proportion of reader facilities, while those in the sciences requiring more time in laboratory experience may be given lower library allowances. Graduate students and faculty in the social sciences, humanities, and certain professional fields, such as business and law, require more time in library research. Law libraries frequently are planned to accommodate 75 to 100 percent of the law school enrollment. Some institutions must allow for a degree of public and professional use of library resources (e.g., business, law, and medicine).

Larger institutions that have a number of departmental or divisional libraries physically separated from the central library usually must account for multiple-reader use in their overall library planning. Undergraduate majors in the sciences will have to use both the science library and the central library, since much of their course work is still in nonscience fields. Law students, even though provided reader Stations in the law library on a one-to-one basis, may still place heavy demands on the central library as well. Variances from single-formula reader Station allowances, such as the typical 25 percent of the FTE enrollment, should be allowed to account for such phenomena.

Some institutions count study facilities outside the library (in residence halls, student centers, and academic buildings) as part of the reader facilities they provide. If such nonlibrary study facilities are not available (e.g., good study conditions in residence halls), a heavier burden is placed on the library. Many librarians argue, however, that nonlibrary study facilities are not a substitute for library reader facilities for which access to library resources is of primary concern.

A variety of types of reader Stations should be provided in a library. The old open reading room with its rows of large study tables has been found unsatisfactory for good study conditions, and this type of reader facility rarely is used in new libraries. Individual study carrels in relatively small clusters now are favored. Microform reader Stations and audio/visual carrels are of increasing importance in the modern library. Other types of reader facilities include lounge reading rooms, group study rooms, typing rooms, and enclosed carrels or studies for faculty

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*California Coordinating Council for Higher Education, *California Higher Education Facilities Planning Guide*, Appendix b., pp. 18-19.

and graduate students engaged in library research.* These different types of reader facilities require different floor area allowances, and the amount of space required for reader facilities will vary with the mix of reader Station types, as well as numbers. The common use in state space standards of 25 Assignable Square Feet per reader Station is seriously inadequate if a high proportion of carrels, microform and audio/visual Stations, and private studies (generally considered to be more effective as study facilities) are to be allowed.

3. Library Staff and Services

The size of the professional and nonprofessional staff of a library will vary with such factors as the size of collection and rates of acquisition, the complexity of specialization of the subject matter acquired and processed, the volume of user demand, and the range of specialized user services provided. Budgetary resources, as usual, place the final constraint on the size and composition of the library staff and the services they are able to offer.

The administrative, technical processing, and user service staffing of a library may be analyzed and projected on the basis of workload indicators associated with their functions.

(a) **Administration**

The management and planning functions of library administration generally are associated with the size of the professional and support staff in technical processes and services. In a small library, the head librarian or director (with some clerical support) may perform all of these functions. Larger and more complex libraries require additional administrative staff to oversee specialized functional areas such as systems, personnel, and budget.

(b) **Technical processes**

This category typically includes:

(1) Acquisitions. The staff required for selection, ordering, and initial receipt of materials generally is a function of the rate of acquisitions. Professional and clerical staffing will vary with the acquisition rate, but when more highly specialized acquisitions are involved (e.g., foreign language material), additional specialized professional staffing may be required. Staffing ratios are being altered by increased automation and by the use of pooled acquisition and cataloging by groups of libraries. (Equipment becomes a major space consumer as automation increases.)

(2) Cataloging. The staff required for recording of acquisitions, cataloging, and entry into stacks of new materials also is primarily a function of acquisition rates. Cataloging becomes more expensive as the amount of foreign language, rare books and manuscripts, and highly technical material increases. Frequent or extensive reshelving and removal of material increases staffing requirements. The use of automation and pooled cataloging services (such as Library of Congress services and state and regional library consortia) are being used to increase the productivity of the cataloging process.

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*See Ralph E. Ellsworth, *Planning the College and University Library Building* (Boulder, Colorado: Pruett Press, 1968), esp. pp. 94-99; *A Study on Studying: A Report from the Community College Planning Center* (Palo Alto: Stanford University, School of Education, 1965); The Committee for New College, *Student Reactions to Study Facilities* (Amherst, Mass.: n.p., 1960); Robert Sommer, "The Ecology of Privacy," *Library Quarterly*, 36 (1966): 234-248.

(3) Binding and mending. If bindery operations are conducted within the library, substantial work Stations and equipment facilities must be provided. Staffing of mending and binding operations depends on the number of periodicals and serials handled and with the age and intensity of use of materials requiring repair and rebinding.

(4) Receiving and mailing. The size of staff and the work areas required will depend primarily on the combined magnitudes of acquisitions and interlibrary loan activities.

(c) **User services**

Library user services typically include:

(1) Circulation. The workloads of retrieval and recording of circulated material increases with the number of users, the size of the collection, and the intensity of use of the collection.

(2) Reference. Staffing of reference services depends primarily on the numbers of users. The nature of the academic program may demand a high level of reference service. Undergraduate programs requiring substantial student research work, graduate programs, and faculty activity in research and scholarly work increase the demand for reference services. In some institutions, public use of reference services may be heavy.

(3) Reserve. Staffing of reserved book collections depends primarily on the size of the undergraduate population. Institutions whose faculties make heavy use of the reserve system for course reading material must staff the reserve desk more heavily and add clerical assistance when reserve materials are changed from term to term.

(4) Interlibrary loan. Staffing for this function as a user service is dependent primarily upon the research activities of faculty and graduate students. In a large research library, demands on interlibrary loans from other institutions and external agencies is a significant factor. Recently, the development of library cooperatives to avoid duplication of highly specialized collections has increased interlibrary loan activity, even in smaller college libraries.

(d) **Other services**

Reproduction services have greatly increased as low-cost photo and electrostatic copying systems have emerged. The conversion of hardcopy books, papers, and documents to microfilm may be extensive in some libraries, requiring substantial staff and equipment space. Computer facilities in libraries are appearing as significant elements, adding specialized staff and equipment space requirements. To the extent that audio/visual services are integrated with the library under the "learning resources center" concept, substantial staffing and space requirements are added to the library organization. Audio/visual facilities are discussed separately in Section 3. of this manual.

The determination of the staffing requirements of a library, given the many variables suggested above, depends on the administrative evaluation of the nature of the given library and its services within the institutional context.

With the technological developments that seem to be on the horizon and with the growth of cooperative efforts in technical processing, the service component of a given library may be reduced in the future. So far, however, automation seems to increase the space required for the service functions of the library; the machines require as much or more space than the people they are supposed to replace (but rarely do). In many cases automation, while it increases the productivity of professiona and clerical staff, adds requirements for new kinds of technical specialists.

In the process of evaluating existing library facilities and projecting future needs, periodic in-depth study of the scope, functions, and organization of the library in the context of institutional goals, objectives, and program characteristics is needed. Library program planning and analysis usually is an interactive process between the library administration and professional staff, faculty, institutional administration, and planning staff. The translation of library programs, functions, and activities into space requirements may take many forms varying from the methods illustrated in the following sections.

In the following pages two different methods for evaluating the current use and projecting future needs of library facilities are presented. First, a set of detailed procedures is presented which is designed to evaluate and project the use of and needs for library facilities. Second, general methods are described which are designed to indicate only general sufficiency of current space or to estimate only total future needs.

For both the detailed and general methods, the determination of additional requirements is derived by subtracting the existing capacity expected to be available for a given projection target from the total projected library facilities required for a given projection target.

Section 2.1.

Detailed Method

LIBRARY FACILITIES

INTRODUCTORY COMMENTS

Because materials are continuously being added to library collections, and because building structures usually must be expanded in relatively large step increments, library buildings should be planned to accommodate relatively long-range growth of collections and services. Ten years is a reasonable minimum time span to consider when a new library is being planned or an existing library is being expanded. Since library facilities requirements are always changing, the evaluation of the capacity of an existing facility always should be done within the context of projected requirements. For this reason the procedures for evaluating existing library capacity and for projecting future library needs will be treated as interdependent. A starting point for the evaluation and projection of library capacities and needs at an existing institution, however, is the evaluation of existing capacity.

Library capacities must be analyzed in three segments:

- ►The capacity of existing stack space (or other space which can be converted into stacks) to house current material and to absorb additional materials
- ►The capacity of existing reader space (or space which can be converted to reader facilities) to accommodate current and projected user populations
- ►The capacity of existing space to accommodate the current and projected staff and also the equipment required to provide for user services, technical services, and administration of the library

The example for both the evaluation and projection sections is designed to show one of many possible variations for the analysis and evaluation of existing library facilities in the context of future library development. In order to illustrate the dynamic nature of library development, the hypothetical example reflects an existing small state college, with liberal arts, education, and business programs, that is to be expanded over the next decade into an "emerging" university with limited graduate programs at the doctoral level. The example is designed to show the impact on library resource requirements of both extensive enrollment growth and programs expanded into the doctoral level. The resulting expansion of the library from a small, inadequate college library into a moderately large university library is purposely designed to illustrate the effects of changes in institutional size and scope of programs on library requirements. The example also emphasizes the need to analyze existing library capacity in terms of projected future library requirements. Two planning stages—roughly five and ten years ahead—are used in the example.

Section 2.1.1

Detailed Method

EVALUATION OF EXISTING LIBRARY FACILITIES

DISCUSSION

DATA TO BE DETERMINED

►Capacity of existing library stacks to absorb additional library materials
►Capacity of existing library reader facilities to serve existing library user population demand
►Capacity of existing library staff and service facilities to accommodate existing staff office and work Station requirements

PROGRAM DATA REQUIRED

►Current library holdings by type of holding
►Current reader population to be served by the existing library facilities by type of reader
►Current number of library staff requiring office and work Stations by type of staff

FACILITIES DATA REQUIRED

►Existing Assignable Square Feet of stack floor space expected to be in continued use at the planning stage
►Existing stack and other storage units by type of unit
►Existing Assignable Square Feet of reader space expected to be in continued use at the planning stage
►Existing reader Stations by type of Station
►Existing Assignable Square Feet of staff and service space expected to be in continued use at the planning stage
►Existing staff office Stations, work Stations, and other service facilities by type of Station or facility

UTILIZATION ASSUMPTIONS REQUIRED

►Density of stack utilization (bound volumes and other types of materials) by type of stack unit or in terms of volumes or equivalent units per Assignable Square Foot
►Proportions of user populations to be provided with library reader Stations
►Number of Assignable Square Feet per reader Station by type of Station
►Types of staff to be provided office and work Station facilities
►Number of Assignable Square Feet per office or work Station by type of work Station
►Allowances to be made for other service facilities

PROCEDURE

Obtain the facilities data from the facilities inventory.

- Existing Assignable Square Feet of stack floor space expected to be in continued use at the planning stage
- Existing stack and other storage units by type of unit
- Existing Assignable Square Feet of reader space expected to be in continued use at the planning stage
- Existing reader Stations by type of Station
- Existing Assignable Square Feet of staff and service space to be in continued use at the planning stage
- Existing staff office Stations, work Stations, and other service facilities by type of Station or facility.

The inventory data, following the *Higher Education Facilities Classification and Inventory Procedures Manual,* should include the Assignable Square Feet of space in the following room type categories: study rooms, stacks, open-stack reading rooms, library processing rooms, study facilities service, and office and office service facilities in the organization unit, library.

Note: *For analytical purposes, space in rooms which have a mixture of reader Stations, stack space, and library service space or staff work Stations must be allocated between stack, reader, and staff and service space. The residual may be allocated to stack space.**

That portion of the space which is attributable to reader space can be calculated by multiplying the number of reader Stations by an average Assignable Square Feet per Station factor. That portion attributable to staff and service space can be calculated by multiplying the number of staff work Stations by an assumed average Assignable Square Feet per work Station factor.

2. Obtain the program data.

   - Current library holdings by type of holding
   - Current reader population to be served by the existing library facilities by type of reader
   - Current number of library staff requiring office and work Stations by type of staff

3. Establish utilization rates as a matter of institutional policy.

   - Density of stack utilization (bound volumes and other types of materials) by type of stack unit or in terms of volumes or equivalent units per Assignable Square Foot
   - Proportions of user populations to be provided with library reader Stations
   - Number of Assignable Square Feet per reader Station by type of Station
   - Types of staff to be provided office and work Station facilities
   - Number of Assignable Square Feet per office or work Station by type of work Station
   - Allowances to be made for other service facilities

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*An excellent example of a method for inventorying library space to differentiate between stack (or shelving) space, reader space, and staff space may be found in Richard H. Perrine, *Library Space Survey of Texas Colleges and Universities* (Austin, Texas: The Coordinating Board, Texas College and University Systems, Study Paper 10, June 1970), pp. 8-14.

Note: *Many states have established standards for the proportions of the user populations to be provided with reader Stations, the most typical standard being 2 percent of the student population. Some states have also established standards for the number of Assignable Square Feet to be allowed for each reader Station. Since library use varies as a function of its academic programs and methods of teaching, it is preferable if the institution establishes these factors in accordance with its particular needs. The result may be a situation in which seating space is provided in varying proportions for students of different majors or levels and for faculty. Different types of Stations may also be provided to users of different categories.*

Spot surveys of reader Station occupancy at different times of the day, days of the week, and weeks of the academic term are useful for purposes of library management, evaluation of the quality of reader facilities, and evaluation of the need for additional reader facilities or alternative study facilities. A sample form for such a survey is illustrated in Figure A. Such a survey should be accompanied by sample interviews of library users to determine their characteristics (e.g., class level, major), the nature of their use of the library, and their views about the quality of reader facilities. (Poor use of library reader facilities often can be attributed to poor environmental quality.) Such a survey also aids in determining the proportions of various user populations that should be provided reader Stations and in determining the types and quality of reader facilities needed to satisfy user needs.

4. Calculate the Assignable Square Feet of stack space required to store the existing collections, given the utilization assumptions concerning storage density factors.

   The nature of this calculation is dependent on the form in which the storage density factor is expressed. If the storage density factor is expressed in terms of number of volumes stored per ASF, then the calculation is accomplished by dividing the number of volumes in the existing collection by the number of volumes shelved per Assignable Square Foot. If the storage density factor is expressed in terms of number of items of various types which can be stored in stack units, this calculation is accomplished by dividing the number of items of each type by the number of such items which can be stored in a stack unit, thus obtaining the number of stack units required. The space required is then calculated by multiplying the number of ASF required per stack unit by the number of stack units required to house the collection.

5. Compare the stack space required to accommodate current collections with the amount of stack space currently available.

   This comparison results in an indication of either the amount of space available for further expansion of collections or the extent to which current stack facilities are overcrowded.

6. Calculate the reader Stations required to accommodate current user populations, given the utilization assumptions established in Step 3 above.

   The number of reader Stations required is calculated by multiplying the number of individuals in each of the specifically identified user groups by the respective proportions of individuals in each category to be provided with reader Stations to determine the number of reader Stations required.

   To the extent that there are different types of reader Stations associated with different types of users, this calculation also indicates the number of Stations of each type. Space required to accommodate these user Stations is calculated by multiplying the required number of Stations of each type by the Assignable Square Feet allotted for a Station of each type.

FIGURE A

SAMPLE FORM

DETAILED SURVEY OF READER STATION USE AND QUALITY

uilding ______ Room No. ______ Room Type ______ Total Assignable Square Feet ______ { Stack ______ ASF
Readers ______ ASF

eader Stations: Type ______ No. ______ ______% Shelving Capacity: Linear Feet ______ No. Volumes ______

Type ______ No. ______ ______% Other Material ______

Type ______ No. ______ ______% Special Equipment ______

Total No. ______ 100 %

Week in Term/Days of Week

Survey Time*	Week: (2)							Week: (7)							Week: (10)							Week: (14)							Analysis	
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	Max.	Mean
7:30 a.m.																														
8:30																														
9.30																														
10:30																														
11:30																														
12:30 p.m.																														
1:30																														
2:30																														
3:30																														
4:30																														
5:30																														
6:30																														
7:30																														
8:30																														
9:30																														
10:30																														
11:30																														
Sums																														
Means																														
Ranges																														

*Approximate midpoints of class periods.

Quality Evaluation: General Condition ______

Lighting ______ Ventilation ______ Traffic ______

Furniture quality and condition ______

7. Compare the reader Stations required to accommodate current user population with existing reader facilities.

8. Determine the distribution of library reader Stations by type of Station, and calculate the Assignable Square Feet of reader space required.

   The distribution of library reader Stations by type of Station can best be made by the judgment of the library staff in consultation with faculty and administrative planning officers. Considerations should account for the expected types of library use demand. Once this distribution of reader Stations by type of Station has been established, the Assignable Square Feet of reader area required can be calculated by multiplying the distribution by the space allowances for the various types of reader Stations.

9. Compare the required Assignable Square Feet of reader space with the current Assignable Square Feet of reader space.

10. Calculate the Assignable Square Feet of service space required and compare the current numbers of work Stations and Assignable Square Feet of service space with the required numbers of Stations and Assignable Square Feet of service space.

COMMENTS ON THE PROCEDURE

The procedures described above serve to aid in evaluating the capacities of space, as currently allocated, to accommodate existing programs and levels of activity. The procedures reflect a situation in which capacities of existing facilities are calculated independently. As a result, when the calculations indicate an excess of space of one type and a deficiency of another, the possibilities of converting space to other uses must be investigated. Most libraries built since World War II are on the "modular" plan with open floor areas interchangeable between stacks, reader facilities, staff facilities, and other uses. Older libraries, however, often were built with fixed, self-supporting stack structures with low floor-to-ceiling heights which are difficult to convert to other uses. If no expansion of the library is expected or needed for some years, the evaluation of existing library facilities of each type may lead to the reassignment of some space, e.g., the conversion of reader areas to stack or staff space.

In cases in which there is a deficiency of reader Station space, the possibilities of providing such facilities in other locations should be investigated. If, for example, a survey shows that library reader Stations are being used only for study purposes and the users are not concurrently making use of other library facilities, library crowding can be relieved by provision of study hall facilities elsewhere on campus.

Section 2.1.1

Detailed Method

EVALUATION OF EXISTING LIBRARY FACILITIES

EXAMPLE

DATA TO BE DETERMINED

- ►Capacity of existing library stacks to absorb additional library materials
- ►Capacity of existing library reader facilities to serve existing library user population demand
- ►Capacity of existing library staff and service facilities to accommodate existing staff office and work Station requirements

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   - ►Existing Assignable Square Feet of stack floor space expected to be in continued use at the planning stage
   - ►Existing stack and other storage units by type of unit
   - ►Existing Assignable Square Feet of reader space expected to be in continued use at the planning stage
   - ►Existing reader Stations by type of Station
   - ►Existing Assignable Square Feet of staff and service space expected to be in continued use at the planning stage
   - ►Existing staff office Stations, work Stations, and other service facilities by type of Station or facility

   Table 1 shows an inventory of existing library rooms described by room type plus a supplementary description of the room; the Assignable Square Feet in each room; the number and type of reader Stations, if any, in each room; the number and type of stack units, if any, in each room; and the number of staff Stations in each room.

   Table 2 summarizes the library inventory in Assignable Square Feet of each room type allocated to the library functions of stacks, readers, and staff and service space.

2. Obtain the program data.

   - ►Current library holdings by type of holding
   - ►Current reader population to be served by the existing library facilities by type of reader
   - ►Current number of library staff requiring office and work Stations by type of staff

TABLE 1

Library Room Inventory

(1) Room No.	(2) Room Type	(3) Description	(4) Assignable Square Feet	(5) Reader Stations	(6) Station Type	(7) Stack Units	(8) Stack Unit Type	(9) Staff Stations
101	Study Room	General	2,800	100	Tables	N/A	N/A	N/A
102	Study Room	Lounge	1,200	38	Lounge	N/A	N/A	N/A
202	Study Room	Microtext and Audio/Visual	1,200	30	Microtext	8	SF Sections*	N/A
205	Study Room	General	2,160	72	Carrels	N/A	N/A	N/A
306	Study Room	General	1,340	42	Carrels	N/A	N/A	N/A
120	Stacks	Level 1	7,000	N/A	N/A	800	SF Sections	N/A
220	Stacks	Level 2	6,500	N/A	N/A	745	SF Sections	N/A
320	Stacks	Level 3	6,500	N/A	N/A	745	SF Sections	N/A
110	Open Stack Reading Room	Reference and Circulation	2,000	25	Tables	67	Ref. Sections	3
112	Open Stack Reading Room	Periodicals and Maps	2,000	25	Tables	100	Various	1
118	Processing Room	Acquisitions	750	N/A	N/A	N/A	N/A	6
119	Processing Room	Cataloging	1,200	N/A	N/A	N/A	N/A	10
122	Processing Room	Binding and Mending	1,120	N/A	N/A	N/A	N/A	3
124	Processing Room	Shipping and Receiving	600	N/A	N/A	N/A	N/A	2
128	Study Facilities Service	Locker Room	100	N/A	N/A	N/A	N/A	N/A
103	Study Facilities Service	Kitchenette	110	N/A	N/A	N/A	N/A	N/A
203	Study Facilities Service	Photocopy Room	300	N/A	N/A	N/A	N/A	1
100	Study Facilities Service	Public Catalog	1,000	N/A	N/A	N/A	N/A	N/A
210	Office	Director	200	N/A	N/A	N/A	N/A	1
211	Office	Associate Director	150	N/A	N/A	N/A	N/A	1
212	Office	Secretaries	200	N/A	N/A	N/A	N/A	2
117	Office	Head, Acquisitions	135	N/A	N/A	N/A	N/A	1
121	Office	Head, Cataloging	135	N/A	N/A	N/A	N/A	1
209	Office Service	Conference	250	N/A	N/A	N/A	N/A	(10)
213	Office Service	Staff Room	390	N/A	N/A	N/A	N/A	(15)
Total		N/A	39,340	332	N/A	2,465	N/A	32

*SF Sections = Single-face stack sections, 3 feet wide, 7 shelves.

TABLE 2

Summary of Existing Library Facilities

(1)	(2)	(3)	(4)	(5)
	Assignable Square Feet Allocated to Library Functions			
Room Type	Stacks	Readers	Staff and Service	Total
Study Rooms	N/A	8,700	N/A	8,700
Stacks	20,000	N/A	N/A	20,000
Open-Stack Reading Rooms	2,000*	1,500**	500***	4,000
Processing Rooms	N/A	N/A	3,670	3,670
Study Facilities Service	N/A	N/A	1,510	1,510
Offices	N/A	N/A	820	820
Office Service	N/A	N/A	640	640
Total	22,000	10,200	7,140	39,340

*Obtained as the residual after reader and staff and service space have been subtracted from the total assignable area in open-stack reading rooms.

**Obtained by assuming an average of 30 Assignable Square Feet for each of the 50 reader Stations located in open-stack reading rooms (Rooms 110 and 112).

***Obtained by assuming an average of 125 Assignable Square Feet for each of the staff work Stations located in open-stack reading rooms.

An inventory of current library holdings by type of holdings is indicated in column 13, Table 3. Historical data on net annual acquisitions (gross acquisitions less losses and renewals) also are included in Table 3.

TABLE 3

FIVE-YEAR GROWTH RATES OF LIBRARY HOLDINGS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
		1966-67		1967-68		1968-69		1969-70		1970-71		1971-72
		Beginning Count	Net Additions	Beginning Count	Net Additions	Beginning Count	Net Additions	Beginning Count	Net Additions	Beginning Count	Net Additions	Beginning Count
Bound Volumes	No.	107,000	12,000	119,000	14,000	133,000	13.000	146,000	16,000	162,000	18,000	180,000
	%		11.2		11.7		9.8		11.0		11.1	
Documents and Pamphlets	No.	20,000	2,000	22,000	1,500	23,500	3,000	26,500	1,000	27,500	2,500	30,000
	%		10.0		6.8		12.8		3.8		9.1	
Microfilm Reels	No.	4,500	800	5,300	1,400	6,700	1,800	8,500	1,200	9,700	1,300	11,000
Microform Cards	No.	25,000	7,000	32,000	8,000	40,000	15,000	55,000	13,000	68,000	12,000	80,000
Newspaper Titles Unbound	No.	32	1	33	2	35	—	35	3	38	2	40
Newspaper Bound Volumes	No.	181	2	183	6	189	4	193	4	197	3	200
Periodical Titles Unbound	No.	180	5	185	7	192	3	195	2	197	3	200
Periodical Titles Boxed	No.	184	3	187	4	191	2	193	2	195	5	200
Recordings	No.	8,000	1,000	9,000	1,200	10,200	3,000	13,200	3,800	17,000	3,000	20,000
	%		12.5		13.3		29.4		28.8		17.6	
Reference Volumes	No.	4,380	100	4,480	215	4,695	110	4,805	95	4,900	100	5,000
Maps	No.	6,000	200	6,200	500	6,700	400	7,100	400	7,500	500	8,000
	%		3.3		8.1		6.0		5.6		6.7	
Slides	No.	15,000	3,000	18,000	3,000	21,000	3,000	24,000	3,000	27,000	3,000	30,000

Note: *These values are not additive.*

Existing reader populations are indicated in Table 4.

TABLE 4

CURRENT LIBRARY USER POPULATIONS

(1)	(2)	(3)
User Populations	Headcount	FTE
Students		
Lower Division	2,100	1,900
Upper Division		
Humanities	400	340
Social Sciences	350	300
Life Sciences	250	210
Physical Sciences	150	125
Business	200	170
Education	300	255
Subtotal	1,650	1,400
Graduate (Masters only)		
Humanities	100	67
Social Sciences	75	50
Life Sciences	50	33
Physical Sciences	25	16
Business	50	34
Education	150	100
Subtotal	450	300
Total Enrollment	4,200	3,600
Faculty	280	225
Public Users	approx. 500	
Total Users	4,980	3,825

Existing library staff requiring office and work Station space are indicated in Table 5.

TABLE 5

EXISTING LIBRARY STAFF REQUIRING OFFICE AND WORK STATION SPACE

(1) Type of Staff	(2) Number of Staff
Administration	
Director	1
Associate Director	1
Assistant Director	—
Director of Systems	—
Secretaries	2
Subtotal	4
Acquisitions	
Head, Acquisitions	1
Area Specialists	2
Clerical	4
Subtotal	7
Cataloging	
Head, Cataloging	1
Catalogers	4
Clerical	6
Subtotal	11
Reference	
Reference Librarians	2
Clerical	2
Subtotal	4
Circulation	
Head, Circulation	—
Circulation Librarians	2
Clerical	4
Subtotal	6
Reserve	
Reserve Librarian	1
Clerical	2
Subtotal	3
Interlibrary Loan	
Librarians	—
Clerical	—
Subtotal	—
Binding and Mending	
Technician	1
Clerical	2
Subtotal	3
Photocopy	
Technician	1
Clerical	1
Subtotal	2
Shipping and Receiving	
Clerical	2
Subtotal	2
Subtotal Staff and Service	42*

*Excludes conference and staff room Stations. In addition there is need for 25 conference room and 25 staff room Stations.

3. Establish utilization rates as a matter of institutional policy.

- ►Density of stack utilization (bound volumes and other types of materials) by type of stack unit or in terms of volumes or equivalent units per Assignable Square Foot
- ►Proportions of user populations to be provided with library reader Stations
- ►Number of Assignable Square Feet per reader Stations by type of Station
- ►Types of staff to be provided office and work Station facilities
- ►Number of Assignable Square Feet per office or work Station by type of work Station
- ►Allowances to be made for other service facilities

Utilization assumptions about density of stack utilization expressed in terms of the number of units of various types of material that can be stored in a stack unit are indicated in Table 6. This table also indicates the number of Assignable Square Feet required per stack unit of each type.

TABLE 6

DENSITY OF STACK UTILIZATION FOR VARIOUS LIBRARY MATERIALS*

(1) Type of Material	(2) Number of Items per Stack Unit	(3) ASF per Stack Unit
Bound Volumes	125 per single-face section	8.7
Documents and Pamphlets	1,000 per single-face section	8.7
Microfilm Reels	400 per single-face section	8.7
Microprint Cards	10,000 per single-face section	8.7
Newspaper Titles Unbound	7 per single-face section	8.7
Newspaper Bound Volumes	9 per single-face section	8.7
Periodical Titles Unbound	15 per display section	15.0
Periodical Titles Boxed	30 per single-face section	8.7
Recordings	500 per single-face section	8.7
Reference Volumes	75 per four-shelf section	15.0
Maps	1,000 per case	42.0
Slides	10,000 per case	17.0

*University of California, Office of the President, *University of California Planning Guide for Libraries: Unit Area Allowances.*

Table 7 indicates the proportions of user populations by type of user to be provided reader Stations.

TABLE 7

PROPORTION OF USER POPULATIONS TO BE PROVIDED READER STATIONS

(1) User Population	(2) Percentage to Be Provided with Reader Stations
Students	
Lower Division	20
Upper Division	
Humanities	30
Social Sciences	30
Life Sciences	20
Physical Sciences	20
Business	30
Education	30
Graduate (Masters only)	
Humanities	40
Social Sciences	40
Life Sciences	25
Physical Sciences	25
Business	30
Education	30
Faculty	15
Public Users	5

Table 8 indicates the allowances for Assignable Square Feet per reader Station by type of Station.

TABLE 8

ASSIGNABLE SQUARE FEET PER READER STATION BY TYPE OF STATION

(1) Type of Station	(2) Assignable Square Feet per Station
Student Users	
Open Tables	25
Small Carrels	30
Research Carrels	40
Microform and Audio/Visual	40
Typing	30
Lounge	30
Small Group	25
Faculty Users	
Faculty Studies	50
Research Carrels	40
Open Tables	25
Public Users	25

Table 9 summarizes the amount of office and work Station space to be allocated to library personnel of different types.

TABLE 9

TYPES OF STAFF TO BE PROVIDED WORK STATIONS AND ASSIGNABLE SQUARE FEET PER STATION*

(1) Type of Staff	(2) Assignable Square Feet per Station
Administration	
Director	240
Associate Director	160
Assistant Director	120
Director of Systems	120
Secretaries	100
Acquisitions	
Head, Acquisitions	150
Area Specialists	120
Clerical	100
Cataloging	
Head, Cataloging	150
Catalogers	120
Clerical	100
Reference	
Reference Librarians	120
Clerical	100
Circulation	
Head, Circulation	150
Circulation Librarians	120
Clerical	100
Reserve	
Reserve Librarians	120
Clerical	100
Interlibrary Loan	
Librarians	120
Clerical	100
Binding and Mending	
Technician	250
Clerical	250
Photocopy	
Technician	250
Clerical	100
Shipping and Receiving	
Clerical	300
Office Support	
Conference Room	25
Staff Room	25

*Other service space can be accounted for in the following manner:

Allowance to be made for other service facilities = 5% of sum of stack, reader, and staff areas

4. Calculate the Assignable Square Feet of stack space required to store the existing collections, given the utilization assumptions concerning storage density factors.

   These calculations are summarized in Table 10.

5. Compare the stack space required to accommodate current collections with the amount of stack space currently available.

   This comparison is included at the bottom of Table 10 and indicates a surplus of 6,635 Assignable Square Feet available but not required to house current collections.

TABLE 10

STACK SPACE REQUIRED BY CURRENT COLLECTIONS

(1)	(2)	(3)	(4)	(5)	(6)
				Assignable Square Feet	
Type of Material	Number of Items or Titles*	Number of Items per Stack Unit**	Number of Units Required (4)=(2)÷(3)	Per Stack Unit**	Total Required (6)=(3)x(5)
Bound Volumes	180,000	125	1,440	8.7	12,530
Documents and Pamphlets	30,000	1,000	30	8.7	260
Microfilm Reels	11,000	400	28	8.7	245
Microprint Cards	80,000	10,000	8	8.7	70
Newspaper Titles Unbound	40	7	6	8.7	50
Newspaper Bound Volumes	200	9	23	8.7	200
Periodical Titles Unbound	200	15	14	15.0	210
Periodical Titles Boxed	200	30	7	8.7	60
Recordings	20,000	500	40	8.7	350
Reference Volumes	5,000	75	67	15.0	1,000
Maps	8,000	1,000	8	42.0	340
Slides	30,000	10,000	3	17.0	50
Total Assignable Square Feet Required					15,365
Total Stack Assignable Square Feet Available					22,000
Remaining Stack Assignable Square Feet					6,635

*From Table 3.
**From Table 6.

6. Calculate the reader Stations required to accommodate current user populations, given the utilization assumptions established in Step 3.

   These calculations are summarized in Table 11.

7. Compare the reader Stations required to accommodate current user populations with existing reader facilities.

   Table 11 indicates a need for 922 reader Stations. The inventory of current facilities (summarized in Table 1) indicates an availability of 332 reader Stations.

TABLE 11

NUMBER OF READER STATIONS DESIRABLE TO ACCOMMODATE CURRENT USER POPULATIONS

(1)	(2)	(3)	(4)	(5)
	Existing		Policy Factors	
User Population	Headcount	FTE*	Percent of FTE in Reader Stations**	Number of Reader Stations (5)=(3)x(4)
Students				
Lower Division	2,100	1,900	20%	380
Upper Division				
Humanities	400	340	30	102
Social Sciences	350	300	30	90
Life Sciences	250	210	20	42
Physical Sciences	150	125	20	25
Business	200	170	30	50
Education	300	255	30	76
Subtotal	1,650	1,400	Av. 27.5	385
Graduate (Masters only)				
Humanities	100	67	40	26
Social Sciences	75	50	40	20
Life Sciences	50	33	25	8
Physical Sciences	25	16	25	4
Business	50	34	30	10
Education	150	100	30	30
Subtotal	450	300	Av. 32.7	98
Total Enrollment	4,200	3,600	Av. 23.9	863
Faculty	280	225	15	34
Public Users	Approx. 500		5	25
Total				922

*From Table 4.
**From Table 7.

8. Determine the distribution of library reader Stations by type of Station and calculate the Assignable Square Feet of reader space required.

TABLE 12

ASSIGNABLE SQUARE FEET OF READER FACILITIES

(1)	(2)	(3)	(4)
Type of Station	Number of Stations*	Assignable Square Feet per Station**	Assignable Square Feet of Reader Space (4)=(2)x(3)
Student Users			
Open Tables	125	25	3,125
Small Carrels	525	30	15,750
Research Carrels	75	40	3,000
Microform and Audio/Visual	75	40	3,000
Typing	5	30	150
Lounge	20	30	600
Small Group	15	25	365
Subtotal	840	N/A	25,990
Faculty Users			
Faculty Studies	30	50	1,500
Research Carrels	10	40	400
Open Tables	35	25	875
Subtotal	75	N/A	2,775
Public Users	7	25	175
Total	922***	N/A	28,940

*Distributed according to administrative decisions.
**From Table 8.
***From Table 11.

9. Compare the required Assignable Square Feet of reader space with the current Assignable Square Feet of reader space.

Required Assignable Square Feet of reader space	=	28,940
Current Assignable Square Feet of reader space	=	10,200
Deficiency	=	18,740 ASF

10. Calculate the Assignable Square Feet of service space required and compare the current numbers of work Stations and Assignable Square Feet of service space with the required numbers of Stations and Assignable Square Feet of service space.

Table 13 shows the office and work Station requirements to house the existing staff, using desired unit area allowances. A total of 42 staff office and work Stations are needed. (The example assumes that clerical staff in circulation, reference, and reserve services are forced to work without Stations in public catalog and stack areas.) Including other service facilities (public catalog, etc.), a total of 9,255 Assignable Square Feet of staff and service space is needed for the existing staff.

The library inventory data shown in Tables 1 and 2 show that the existing facilities have a total of 32 office or work Stations for staff. Including other service areas (public catalog, conference room, staff room, etc.), a total of 7,140 Assignable Square Feet in staff and service space are available.

The available staff and service area space is contrasted with the amounts required at the bottom of Table 13. The comparison indicates a deficiency of 2,115.

TABLE 13

STAFF OFFICE AND WORK STATIONS REQUIRED FOR EXISTING LIBRARY PERSONNEL

(1)	(2)	(3)	(4)
	Number of Stations*	ASF per Station**	Assignable Square Feet (4)=(2)x(3)
Administration			
Director	1	240	240
Associate Director	1	160	160
Assistant Director	—	—	—
Director of Systems	—	—	—
Secretaries	2	100	200
Subtotal	4		600
Acquisitions			
Head, Acquisitions	1	150	150
Area Specialists	2	120	240
Clerical	4	100	400
Subtotal	7		790
Cataloging			
Head, Cataloging	1	150	150
Catalogers	4	120	480
Clerical	6	100	600
Subtotal	11		1,230
Reference			
Reference Librarians	2	120	240
Clerical	2	100	200
Subtotal	4		440
Circulation			
Head, Circulation	—	—	—
Circulation Librarians	2	120	240
Clerical	4	100	400
Subtotal	6		640
Reserve			
Reserve Librarian	1	120	120
Clerical	2	100	200
Subtotal	3		320
Interlibrary Loan			
Librarians	—	—	—
Clerical	—	—	—
Subtotal	—	—	—
Binding and Mending			
Technician	1	250	250
Clerical	2	250	500
Subtotal	3		750

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*From Table 5.
**From Table 9.

TABLE 13 (continued)

(1)	(2)	(3)	(4)
	Number of Stations*	ASF per Station**	Assignable Square Feet (4)=(2)x(3)
Photocopy			
Technician	1	250	250
Clerical	1	100	100
Subtotal	2		350
Shipping and Receiving			
Clerical	2	300	600
Storage	—	—	1,000
Subtotal	2		1,600
Office Support			
Conference Room	(10)	25	250
Staff Room	(15)	25	375
Supply Room	—	—	300
Subtotal	(25)		925
Subtotal Staff and Service	42*		7,645
Plus 5% of stack and reader allowance for other service areas (public catalog, storage, etc.)			1,610
Total Staff and Service Area Required			9,255
Existing Staff and Service Area			−7,140
Deficiency			2,115

*Excludes conference and staff room Stations. From Table 5.

**From Table 9.

COMMENTS ON THE PROCEDURE

The example illustrates a situation in which an institution is faced with an excess of stack space and deficiencies of both reader and staff and service areas. As a tentative solution some of the excess stack space could be converted to other purposes.

However, since the example institution is also projecting major growth requiring substantial expansion of library collection, services, and staff, any such conversion should be made in the light of anticipated growth.

Table 3 shows a five-year history of acquisitions of various types of materials. If the acquisition rates were to continue at approximately the same rates (e.g., about 20,000 bound volumes per year), the existing stack capacity will be exhausted in less than four years.

Since the current excess stack space which could be converted to other purposes will be needed to serve its intended purposes within approximately four years and since requirements for other types of space will most likely increase drastically, there is little to be gained from stop-gap conversion activities. The example shows acute need for immediate planning of library expansion.

It should also be noted that library expansion often occurs by the development of separate departmental or divisional libraries, rather than by expansion of the central facility. In large, complex institutions the development of specialized libraries in separate facilities often is both necessary and desirable. If the separate divisional libraries are large enough, they can be operated efficiently. However, if a number of small departmental libraries are developed which cannot be adequately staffed and which require excessive duplication of material, serious operational inefficiencies may result. In any evaluation of library resources, all of the institution's library resources should be included.

This example shows that evaluation of library capacity must be conducted in conjunction with projections of future requirements. Therefore, it is suggested that the procedures of this section and those of the following section be used in conjunction with each other.

To an increasing extent, cooperation in the sharing of library resources among nearby institutions is an important factor in library planning. In these cases, the evaluation of existing library facilities may be done on a multiinstitution basis.

Section 2.1.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR LIBRARY FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- Projected additional Assignable Square Feet of library stack space required
- Projected additional Assignable Square Feet of library reader space required
- Projected additional Assignable Square Feet of library staff office, work Station, and other service space required

PROGRAM DATA REQUIRED

- Current library holdings by type of holding
- Current reader population served by the existing library facilities by type of reader
- Current number of library staff requiring office and work Stations by type of staff
- Projected expected annual rates of growth of library collections to the planning target stage by type of holding
- Projected reader populations to be served by the library facilities at the planning target stage by type of reader
- Projected number of library staff requiring office and work Stations by type of staff at the planning target stage

FACILITIES DATA REQUIRED

- Existing Assignable Square Feet of stack floor space expected to be in continued use at the planning stage
- Existing stack and other storage units by type of unit
- Existing Assignable Square Feet of reader space expected to be in continued use at the planning stage
- Existing reader Stations by type of Station
- Existing staff office Stations, work Stations, and other service facilities by type of Station or facility

UTILIZATION ASSUMPTIONS REQUIRED

- Density of stack utilization (bound volumes and other types of materials) by type of stack unit or in terms of volumes or equivalent units per Assignable Square Foot
- Proportions of projected reader populations to be provided with library reader Stations
- Number of Assignable Square Feet per reader Station by type of Station
- Types of projected staff to be provided office and work Station facilities
- Number of Assignable Square Feet per office or work Station by type of work Station
- Allowances to be made for other service facilities

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   ►Existing Assignable Square Feet of stack floor space expected to be in continued use at the planning stage
   ►Existing stack and other storage units by type of unit
   ►Existing Assignable Square Feet of reader space expected to be in continued use at the planning stage
   ►Existing reader Stations by type of Station
   ►Existing Assignable Square Feet of staff and service space expected to be in continued use at the planning stage
   ►Existing staff office Stations, work Stations, and other service facilities by type of Station or facility

2. Obtain the program data.

   ►Current library holdings by type of holding
   ►Current reader population served by the existing library facilities by type of reader
   ►Current number of library staff requiring office and work Stations by type of staff
   ►Projected expected annual rates of growth of library collections to the planning target stage by type of holding
   ►Projected reader populations to be served by the library facilities at the planning target stage by type of reader
   ►Projected number of library staff requiring office and work Stations at the planning target stage by type of staff

   The program data, both current and projected, should be formatted in a way which reflects the desired shelving, seating, and staffing patterns. Moreover, in many cases, projected rates of growth for library holdings will vary not only by type of media but also by year. Such varied increases in holdings often have subtle implications for book purchase and staff operating expenses. These should be analyzed in detail before such projections are incorporated in the facilities planning procedures.

   Projected program data are obtained from the procedures discussed in Manual Six. However, it should be mentioned that the bases for projecting library staff are extremely difficult to verify. Changing library operation technologies, the judgment of professional librarians, and the experience of similar libraries must be considered. Typically, the library staff does not grow at a rate equivalent to the growth rate of users or holdings. Automation, the use of pooled interlibrary acquisitions and cataloging services, and the realization of economies of scale all effect this lower growth rate.

3. Establish utilization rates as a matter of institutional policy.

   ►Density of stack utilization (bound volumes and other types of materials) by type of stack unit or in terms of volumes or equivalent units per Assignable Square Foot
   ►Proportions of projected reader populations to be provided with library reader Stations at maximum use
   ►Number of Assignable Square Feet per reader Station by type of Station
   ►Types of projected staff to be provided office and work Station facilities
   ►Number of Assignable Square Feet per office or work Station by type of work Station
   ►Allowances to be made for other service facilities

Utilization assumptions concerning density of volume storage should account for the fact that bound volumes occupy significantly more stack space than do other forms of library materials. Therefore, care must be taken to evaluate the storage density factor in terms of whether it represents storage of only bound volumes or all types of materials.

Typically, there exists a differential degree of reader Station use by level of student and major discipline. It is often the case that lower division students are more involved in textbook-oriented courses and, therefore, require less library space. Upper division humanities, social sciences, and professional majors often are given a higher allowance than those in the life sciences and physical sciences. Graduate students are given the highest allowances, but with lower proportions in the sciences. If the mix of student population changes radically by field or level, the overall ratio of student-related reader Stations to the total FTE Students would vary significantly.

The utilization rates which are established should account not only for the percentages of populations to be served, but should also establish space allowances for the volumes, readers (or users), and staff.

4. Project the expected annual growth of library collections by type of material through the planning target stages.

   The expected annual growth of library collections is the result of summing the expected growth rates for each type of material for each year through the target planning stages.

5. Determine the Assignable Square Feet of stack floor area required to accommodate the projected library collections at each planning stage, according to the type of stack or other storage unit and the desired density of stack utilization.

   The Assignable Square Feet of stack floor area required is the product of multiplying the expected number of library holdings by type of holding at each of the planning stages by the storage density factor.

6. Project the library reader Station requirements.

   Library reader Station requirements are determined by multiplying the various populations of users by the percent of those populations which are to be reader Stations at each of the planning target stages.

7. Determine the distribution of library reader Stations by type of Station and calculate the Assignable Square Feet of reader area required at each planning stage.

   The distribution of library reader Stations by type of Station can best be made by the judgment of the library staff in consultation with faculty and administrative planning officers. Considerations should account for the expected types of library use demand.

   Once this distribution of reader Stations by type of Station has been established, the Assignable Square Feet of reader area required at each planning stage can be calculated by multiplying the distribution by the space allowances for the various types of reader Stations.

8. Determine the projected staff to be provided with office or other work Stations and calculate the Assignable Square Feet of staff space required at each planning stage.

If the library operates on a multishift basis, then it is likely that one office or work Station may suffice for more than one library staff member. Once the number of work Stations by type of Station for each planning stage has been determined, the Assignable Square Feet of staff space becomes a simple calculation.

9. Determine the increment of other types of service space required that are not directly staff generated (e.g., public catalog, display, waiting, and storage space).

   For facilities projection purposes, other types of service space are most easily allowed for in terms of a given percentage of the sum of stack, reader, and staff (office and Stations) space. The percentage ranges typically from five percent to 10 percent, depending upon the needs. Extraordinary service space needs which result from specialized equipment often are accounted for separately.

   These other kinds of service space can and should be specifically defined for building programming purposes, but their need often is best determined in the early stages of design studies.

10. If an existing library is to be expanded, determine the types of existing space that will remain in continued use at each planning stage, and subtract it from the total projected Assignable Square Feet of each type to determine the additional space needed.

    Generally, this type of procedure can be determined with exactness after preliminary architectural design studies have been completed. Expansion of existing library space typically involves extensive changes in function as well as in actual floor area.

    This step also involves the determination of additional space needed by subtracting existing space from projected space by type of space.

COMMENTS ON THE PROCEDURE

The projection of library facility requirements can take many forms at varying levels of detail. A relatively fine level of detail is illustrated in these procedures since each type of library material, each type of library user, and each kind of library staff and service function are to be analyzed and projected. This level of detail leads directly to the detail needed for building programming, as well as medium-range (five- to ten-year) budgetary and site planning for the library.

This type of projection and programming requires in-depth evaluation and analysis of the library needs of the institution in relation to its developing academic programs. The procedures given here can only imply the extensive analysis, discussion, and policy evaluation that must occur in the development of such projections. This kind of investigation and deliberation must involve the librarians, faculty, administration, students, and, at least in its broader scope, the governing board and, in many cases, the state coordinating agency.

It should be noted that many librarians, with considerable justification, advocate the planning of library buildings twenty years in advance. However, detailed projections that far ahead are somewhat pointless, and for longer-range projections the more general methods of projecting future library requirements, outlined in Section 2.2.2, are suggested. In most cases, limited construction funds require construction of expansion in stages, but a minimum of ten years is suggested. In designing future library facilities, the institution should insure that the architect has studied the project carefully and allowed for very long range, efficient expansion of the library facilities.

Section 2.1.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR LIBRARY FACILITIES

EXAMPLE

DATA TO BE DETERMINED

- ►Projected additional Assignable Square Feet of library stack space required
- ►Projected additional Assignable Square Feet of library reader space required
- ►Projected additional Assignable Square Feet of library staff office, work Station, and other service space required

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   - ►Existing Assignable Square Feet of stack floor space expected to be in continued use at the planning stage
   - ►Existing stack and other storage units by type of unit
   - ►Existing Assignable Square Feet of reader space expected to be in continued use at the planning stage
   - ►Existing reader Stations by type of Station
   - ►Existing Assignable Square Feet of staff and service space expected to be in continued use at the planning stage
   - ►Existing staff office Stations, work Stations, and other service facilities by type of Station or facility

TABLE 14

LIBRARY ROOM INVENTORY

(1) Room No.	(2) Room Type	(3) Description	(4) Assignable Square Feet	(5) Reader Stations	(6) Station Type	(7) Stack Units	(8) Stack Unit Type	(9) Staff Stations
101	Study Room	General	2,800	100	Tables	N/A	N/A	N/A
102	Study Room	Lounge	1,200	38	Lounge	N/A	N/A	N/A
202	Study Room	Microtext and Audio/Visual	1,200	30	Microtext	8	SF Sections*	N/A
205	Study Room	General	2,160	72	Carrels	N/A	N/A	N/A
306	Study Room	General	1,340	42	Carrels	N/A	N/A	N/A
120	Stacks	Level 1	7,000	N/A	N/A	800	SF Sections	N/A
220	Stacks	Level 2	6,500	N/A	N/A	745	SF Sections	N/A
320	Stacks	Level 3	6,500	N/A	N/A	745	SF Sections	N/A
110	Open Stack Reading Room	Reference and Circulation	2,000	25	Tables	67	Ref. Sections	3
112	Open Stack Reading Room	Periodicals, Maps	2,000	25	Tables	100	Various	1
118	Processing Room	Acquisitions	750	N/A	N/A	N/A	N/A	6
119	Processing Room	Cataloging	1,200	N/A	N/A	N/A	N/A	10
122	Processing Room	Binding and Mending	1,120	N/A	N/A	N/A	N/A	3
124	Processing Room	Shipping and Receiving	600	N/A	N/A	N/A	N/A	2
128	Study Facilities Service	Locker Room	100	N/A	N/A	N/A	N/A	N/A
103	Study Facilities Service	Kitchenette	110	N/A	N/A	N/A	N/A	N/A
203	Study Facilities Service	Photocopy Room	300	N/A	N/A	N/A	N/A	1
100	Study Facilities Service	Public Catalog	1,000	N/A	N/A	N/A	N/A	N/A
210	Office	Director	200	N/A	N/A	N/A	N/A	1

SF Sections = Single-face stack sections, 3 feet wide, 7 shelves.

TABLE 14 (continued)

(1) Room No.	(2) Room Type	(3) Description	(4) Assignable Square Feet	(5) Reader Stations	(6) Station Type	(7) Stack Units	(8) Stack Unit Type	(9) Staff Stations
211	Office	Associate Director	150	N/A	N/A	N/A	N/A	1
212	Office	Secretaries	200	N/A	N/A	N/A	N/A	2
117	Office	Head, Acquisitions	135	N/A	N/A	N/A	N/A	1
121	Office	Head, Cataloging	135	N/A	N/A	N/A	N/A	1
209	Office Service	Conference	250	N/A	N/A	N/A	N/A	(10)
213	Office Service	Staff Room	390	N/A	N/A	N/A	N/A	(15)
Total		N/A	39,340	332	N/A	2,465	N/A	32

TABLE 15

SUMMARY OF EXISTING LIBRARY FACILITIES

(1)	(2)	(3)	(4)	(5)
	Assignable Square Feet Allocated to Library Functions			
Room Type	Stacks	Readers	Staff and Service	Total
Study Rooms	N/A	8,700	N/A	8,700
Stacks	20,000	N/A	N/A	20,000
Open-Stack Reading Rooms	2,000	1,500	500	4,000
Processing Rooms	N/A	N/A	3,670	3,670
Study Facilities Service	N/A	N/A	1,510	1,510
Offices	N/A	N/A	820	820
Office Service	N/A	N/A	640	640
Total	22,000	10,200	7,140	39,340

2. Obtain the program data.

►Current library holdings by type of holding

►Current reader populations served by the existing library facilities by type of reader

►Current number of library staff requiring office and work Stations by type of staff

►Projected expected annual rates of growth of library collections to the planning target stage by type of holding

►Projected reader populations to be served by the library facilities at the planning target stage by type of reader

►Projected number of library staff requiring office work Stations at the planning target stage by type of staff

TABLE 16

CURRENT AND PROJECTED READER POPULATIONS

(1)	(2)	(3)	(4)	(5)
User Populations	Headcount	FTE	Stage I FTE Users	Stage II FTE Users
Students				
Lower Division	2,100	1,900	3,000	4,500
Upper Division				
Humanities	400	340	600	1,000
Social Sciences	350	300	550	900
Life Sciences	250	210	300	500
Physical Sciences	150	125	200	400
Business	200	170	250	600
Education	300	255	400	500
Subtotal	1,650	1,400	2,300	3,900
Graduate (Masters only)				
Humanities	100	67	150	300
Social Sciences	75	50	125	350
Life Sciences	50	33	75	125
Physical Sciences	25	16	50	100
Business	50	34	100	300
Education	150	100	200	350
Subtotal	450	300	700	1,600
Total Enrollment	4,200	3,600	6,000	10,000
Faculty	280	225	380	685
Public Users	approx. 500		approx. 800	approx. 1,000

TABLE 17

INVENTORY OF EXISTING LIBRARY COLLECTIONS

(1)	(2)	(3)	(4)	(5)	(6)
		Stack Units Filled		Assignable Square Feet	
Type of Material	Number of Items or Titles	Number	Type	Per Stack Unit	Total Occupied
Bound Volumes	180,000	1,440	Single-face sections	8.7	12,530
Documents and Pamphlets	30,000	30	Single-face sections	8.7	260
Microfilm Reels	11,000	28	Single-face sections	8.7	245
Microprint Cards	80,000	8	Single-face sections	8.7	70
Newspaper Titles Unbound	40	6	Single-face sections	8.7	50
Newspaper Bound Volumes	200	23	Single-face sections	8.7	200
Periodical Titles Unbound	200	14	Display sections	15.0	210
Periodical Titles Boxed	200	7	Single-face sections	8.7	60
Recordings	20,000	40	Single-face sections	8.7	350
Reference Volumes	5,000	67	Four-shelf sections	15.0	1,000
Maps	8,000	8	Cases	42.0	340
Slides	30,000	3	Cases	17.0	50
Total Assignable Square Feet Occupied					15,365
Total Stack Assignable Square Feet Available					22,000
Remaining Stack Assignable Square Feet					6,635

TABLE 18

EXISTING LIBRARY STAFF REQUIRING OFFICE AND WORK STATION SPACE

(1) Type of Staff	(2) Number of Staff
Administration	
Director	1
Associate Director	1
Assistant Director	—
Director of Systems	—
Secretaries	2
Subtotal	4
Acquisitions	
Head, Acquisitions	1
Area Specialists	2
Clerical	4
Subtotal	7
Cataloging	
Head, Cataloging	1
Catalogers	4
Clerical	6
Subtotal	11
Reference	
Reference Librarians	2
Clerical	2
Subtotal	4
Circulation	
Circulation Librarians	2
Head, Circulation	—
Clerical	4
Subtotal	6

(1) Type of Staff	(2) Number of Staff
Reserve	
Reserve Librarian	1
Clerical	2
Subtotal	3
Interlibrary Loan	
Librarians	—
Clerical	—
Subtotal	—
Binding and Mending	
Technician	1
Clerical	2
Subtotal	3
Photocopy	
Technician	1
Clerical	1
Subtotal	2
Shipping and Receiving	
Clerical	2
Subtotal	2
Subtotal Staff and Service	42*

*Excludes conference and staff room Stations. In addition there is need for 25 conference room and 25 staff room Stations.

TABLE 19

PROJECTED ANNUAL ADDITIONS TO LIBRARY COLLECTIONS

(1) Stage	(2) Year	(3) Bound Volumes	(4) Documents and Pamphlets	(5) Microfilm Reels	(6) Microform Cards	(7) Newspaper Bound Volumes	(8) Periodical Titles	(9) Recordings	(10) Maps	(11) Slides	(12) Reference Volumes
Current	1970-71	18,000	2,500	1,300	12,000	40	10	2,000	500	3,000	
	1971-72	20,000	3,000	1,100	12,000	40	10	2,000	500	3,000	
	1972-73	25,000	3,300	1,200	12,000	40	10	2,200	500	3,000	
	1973-74	30,000	3,600	1,300	12,000	40	10	2,400	500	3,000	
	1974-75	40,000	4,000	1,400	12,000	40	10	2,600	500	3,000	
Planning	1975-76	45,000	4,400	1,600	12,000	40	10	2,900	500	3,000	3,000
Stage I	1976-77	50,000	4,800	1,700	12,000	40	10	3,200	500	3,000	
	1977-78	50,000	5,300	1,900	12,000	40	10	3,500	500	3,000	
	1978-79	50,000	5,800	2,100	12,000	40	10	3,800	500	3,000	
Planning	1979-80	50,000	6,400	2,300	12,000	40	10	4,200	500	3,000	
Stage II	1980-81	50,000	7,000	2,500	12,000	40	10	4,600	500	3,000	2,000

TABLE 20

PROJECTION OF LIBRARY STAFF

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Existing			Planning Stage I			Planning Stage II		
ibrary Unit	Adminis-trative	Profes-sional	Clerical	Adminis-trative	Profes-sional	Clerical	Adminis-trative	Profes-sional	Clerical
dministration	2	0	2	3	0	3	3	1	3
cquisitions	1	2	4	1	3	6	1	5	8
ataloging	1	4	6	1	6	9	1	10	14
eference	0	2	2(4)	0	3	4(6)	0	4	6(8)
irculation	0	2	4(8)	0	3	8(12)	1	4	10(16)
eserve	0	1	2(4)	0	1	4(8)	0	1	6(10)
nterlibrary Loan	0	0	0	0	1	1	0	1	1
inding and ending	0	1	2	0	1	3	0	1	4
hotocopy	0	1	1	0	1	2	0	1	2
hipping and eceiving	0	0	2	0	0	3	0	0	4
otal	4	13	25(33)	5	19	43(53)	6	25	56(68)
	Total Staff = 50			Total Staff = 77			Total Staff = 99		

ote: *Figures in parenthesis indicate total staff including second shift operations personnel.*

. Establish utilization rates as a matter of institutional policy.

- ►Density of stack utilization (bound volumes and other types of materials) by type of stack unit or in terms of volumes or equivalent units per Assignable Square Foot
- ►Proportions of projected reader populations to be provided with library reader Stations at maximum use
- ►Number of Assignable Square Feet per reader Station by type of Station
- ►Types of projected staff to be provided office and work Station facilities
- ►Number of Assignable Square Feet per office or work Station by type of work Station
- ►Allowances to be made for other service facilities

TABLE 21

Density of Stack Utilization by Type of Material

(1) Type of Material	(2) Items per Stack Unit	(3) ASF per Stack Unit
Bound Volumes	125	8.7
Documents and Pamphlets	1,000	8.7
Microfilm Reels	400	8.7
Microform Cards	10,000	8.7
Newspaper Titles Unbound	7	8.7
Newspaper Bound Volumes	9	8.7
Periodical Titles Unbound	15	15.0
Periodical Boxed Titles	30	8.7
Recordings	500	8.7
Reference Volumes	75	15.0
Maps	1,000	42.0
Slides	5,000	17.0

TABLE 22

Proportions of Projected User Populations to Be Provided with Reader Stations

(1) Type of User	(2) Percent Reader Stations
Students	
Lower Division	20
Upper Division	
Humanities	30
Social Sciences	30
Life Sciences	20
Physical Sciences	20
Business	30
Education	30
Graduate	
Humanities	40
Social Sciences	40
Life Sciences	25
Physical Sciences	25
Business	30
Education	30
Faculty Users	25
Public Users	3

TABLE 23

ASSIGNABLE SQUARE FEET PER READER STATION BY TYPE OF STATION

(1)	(2)
Type of Station	Assignable Square Feet per Station
Student Users	
Open Tables	25
Small Carrels	30
Research Carrels	40
Microform and Audio/Visual	40
Typing	30
Lounge	30
Small Group	25
Faculty Users	
Faculty Studies	50
Research Carrels	40
Open Tables	25
Public Users	25

TABLE 24

TYPES OF STAFF TO BE PROVIDED WORK STATIONS AND ASSIGNABLE SQUARE FEET PER STATION*

(1)	(2)
Type of Staff	Assignable Square Feet per Station
Administration	
Director	240
Associate Director	160
Assistant Director	120
Director of Systems	120
Secretaries	100
Acquisitions	
Head, Acquisitions	150
Area Specialists	120
Clerical	100
Cataloging	
Head, Cataloging	150
Catalogers	120
Clerical	100
Reference	
Reference Librarian	120
Clerical	100
Circulation	
Head, Circulation	150
Circulation Librarian	120
Clerical	100
Reserve	
Reserve Librarian	120
Clerical	100
Interlibrary Loan	
Librarians	120
Clerical	100
Binding and Mending	
Technician	250
Clerical	250
Photocopy	
Technician	250
Clerical	100
Shipping and Receiving	
Clerical	300
Office Support	
Conference Room	25
Staff Room	25

Other service space can be accounted for in the following manner:

Allowance to be made for other service facilities = 5% of sum of stack, reader, and staff areas

4. Project the expected annual growth of library collections by type of materia through the planning target stages.

   The expected annual growth of library collections is the result of summing th expected growth rates for each type of material of each year through the targe planning stages.

TABLE 25

PROJECTED GROWTH OF LIBRARY COLLECTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Bound Volumes		Documents and Pamphlets		Microfilm Reels	
	Year	Net Additions	End of Year	Net Additions	End of Year	Net Additions	End o Year
Current	1970-71	18,000	180,000	2,500	30,000	1,300	11,00
	1971-72	20,000	200,000	3,000	33,000	1,100	12,10
	1972-73	25,000	225 000	3,300	36,300	1,200	13,30
	1973-74	30,000	255,000	3,600	39,900	1,300	14,60
Planning Stage I	1974-75	40,000	295,000	4,000	43,900	1,400	16,00
	1975-76	45,000	340,000	4,400	48,300	1,600	17,60
	1976-77	50,000	390,000	4,800	53,100	1,700	19,30
	1977-78	50,000	440,000	5,300	58,400	1,900	21,20
	1978-79	50,000	490,000	5,800	64,200	2,100	23,30
Planning Stage II	1979-80	50,000	540,000	6,400	70,600	2,300	25,60
	1980-81	50,000	590,000	7,000	77,600	2,500	28,10

		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
		Microform Cards								
	Year	Net Additions	End of Year	News-paper Titles	News-paper Bound Volumes	Periodical Titles	Recordings	Maps	Slides	Reference Volume
Current	1970-71	12,000	80,000	40	200	200	20,000	8,000	30,000	5,000
	1971-72	12,000	92,000	42	240	210	22,000	8,500	33,000	
	1972-73	12,000	104,000	44	280	220	24,200	9,000	36,000	
	1973-74	12,000	116,000	46	320	230	26,600	9,500	39,000	
Planning Stage I	1974-75	12,000	128,000	48	360	240	29,200	10,000	42,000	
	1975-76	12,000	140,000	50	400	250	32,100	10,500	45,000	8,000
	1976-77	12,000	152,000	52	440	260	35,300	11,000	48,000	
	1977-78	12,000	164,000	54	480	270	38,800	11,500	51,000	
	1978-79	12,000	176,000	56	520	280	42,600	12,000	54,000	
Planning Stage II	1979-80	12,000	188,000	58	560	290	46,800	12,500	57,000	
	1980-81	12,000	200,000	60	600	300	51,400	13,000	60,000	10,000

5. Determine the Assignable Square Feet of stack floor area required to accommodat the projected library collections at each planning stage, according to the type stack or other storage unit and the desired density of stack utilization.

TABLE 26

PROJECTION OF LIBRARY STACK REQUIREMENTS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Planning Stage I					Planning Stage II				
Type of Material	No. of Items or Titles	Items per Stack Unit	No. of Stack Units (4)=(2)÷(3)	ASF per Stack Unit	Total ASF (6)=(4)x(5)	No. of Items or Titles	Items per Stack Unit	No. of Stack Units (9)=(7)÷(8)	ASF per Stack Unit	Total ASF (11)=(9)x(10)
Bound Volumes	340,000	125	2,720	8.7	23,664	590,000	125	4,720	8.7	41,064
Documents and Pamphlets	48,300	1,000	48.3	8.7	420	77,600	1,000	77.6	8.7	675
Microfilm Reels	17,600	400	44	8.7	383	28,100	400	70	8.7	611
Microform Cards	140,000	10,000	14	8.7	122	200,000	10,000	20	8.7	174
Newspaper Titles Unbound	50	7	7.1	8.7	62	60	7	8.6	8.7	75
Newspaper Bound Volumes	400	9	45	8.7	392	600	9	67	8.7	583
Periodical Titles Unbound	250	15	17	15.0	250	300	15	20	15.0	300
Periodical Boxed Titles	250	30	8.3	8.7	72	300	30	10	8.7	87
Recordings	32,100	500	64.2	8.7	558	51,400	500	103	8.7	895
Reference Volumes	8,000	75	107	15.0	1,600	10,000	75	133	15.0	2,000
Maps	10,500	1,000	10.5	42.0	440	13,000	1,000	13	42.0	546
Slides	45,000	5,000	9	17.0	153	60,000	5,000	12	17.0	204
Total Assignable Square Feet					28,116					47,214

6. Project the library reader Station requirements.

TABLE 27

PROJECTION OF LIBRARY READER STATION REQUIREMENTS

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Planning Stage I			Planning Stage II		
Type of User	FTE Users	Percent Reader Stations	Number of Reader Stations	FTE Users	Percent Reader Stations	Number of Reader Stations
Students						
Lower Division	3,000	20	600	4,500	20	900
Upper Division						
Humanities	600	30	180	1,000	30	300
Social Sciences	550	30	165	900	30	270
Life Sciences	300	20	60	500	20	100
Physical Sciences	200	20	40	400	20	80
Business	250	30	75	600	30	180
Education	400	30	120	500	30	150
Subtotal	2,300	Avg. 27.8	640	3,900	Avg. 27.7	1,080
Graduate						
Humanities	150	40	60	300	40	120
Social Sciences	125	40	50	350	40	140
Life Sciences	75	25	18	125	25	30
Physical Sciences	50	25	12	100	25	25
Business	100	30	30	300	30	90
Education	200	30	60	350	30	105
Subtotal	700	Avg. 32.8	230	1,600	Avg. 32.0	510
Total Student Users	6,000	Avg. 24.5	1,470	10,000	Avg. 24.9	2,490
Faculty Users	380	25	95	685	25	170
Public Users	approx. 800	3	25	approx. 1,000	3	30

7. Determine the distribution of library reader Stations by type of Station and calculate the Assignable Square Feet of reader area required at each planning stage.

TABLE 28

PROJECTION OF LIBRARY READER FLOOR AREAS

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Planning Stage I			Planning Stage II		
Type of Station	Number of Stations*	ASF per Station	Assignable Square Feet	Number of Stations*	ASF per Station	Assignable Square Feet
Student Users						
Open Tables	150	25	3,750	250	25	6,250
Small Carrels	750	30	22,500	1,250	30	37,500
Research Carrels	150	40	6,000	450	40	18,000
Microform and Audio/Visual	150	40	6,000	350	40	14,000
Typing	10	30	300	20	30	600
Lounge	50	30	1,500	50	30	1,500
Small Group	60	25	1,500	120	25	3,000
Subtotal	1,470	N/A	41,550	2,490	N/A	80,850
Faculty Users						
Faculty Studies	40	50	2,000	70	50	3,500
Research Carrels	20	40	800	50	40	2,000
Open Tables	35	25	875	50	25	1,250
Subtotal	95	N/A	3,675	170	N/A	6,750
Public Users	25	25	625	30	25	750
Total	1,590	N/A	45,850	2,690	N/A	88,350

*Distributions determined by administrative decision.

8. Determine the projected staff to be provided with office or other work Stations and calculate the Assignable Square Feet of staff space required at each planning stage.

TABLE 29

PROJECTION OF STAFF OFFICE AND WORK STATION REQUIREMENTS

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Planning Stage I			Planning Stage II		
	Number of Stations	ASF per Station	Assignable Square Feet	Number of Stations	ASF per Station	Assignable Square Feet
Administration						
Director	1	240	240	1	240	240
Associate Director	1	160	160	1	160	160
Assistant Director	1	120	120	1	120	120
Director of Systems	—	—	—	1	120	120
Secretaries	3	100	300	3	100	300
Subtotals	6		820	7		940
Acquisitions						
Head, Acquisitions	1	150	150	1	150	150
Area Specialists	3	120	360	5	120	600
Clerical	6	100	600	8	100	800
Subtotal	10		1,110	14		1,550
Cataloging						
Head, Cataloging	1	150	150	1	150	150
Catalogers	6	120	220	10	120	1,200
Clerical	9	100	900	14	100	1,400
Subtotal	16		1,770	25		2,750
Reference						
Reference Librarians	3	120	360	4	120	480
Clerical	4	100	400	6	100	600
Subtotal	7		760	10		1,080
Circulation						
Head, Circulation	—	—	—	1	150	150
Circulation Librarians	3	120	360	4	120	480
Clerical	8	100	800	10	100	1,000
Subtotal	11		1,160	15		1,630
Reserve						
Reserve Librarian	1	120	120	1	120	120
Clerical	4	100	400	6	100	600
Subtotal	5		520	7		720
Interlibrary Loan						
Librarian	1	120	120	1	120	120
Clerical	1	100	100	1	100	100
Subtotal	2		220	2		220
Binding and Mending						
Technician	1	250	250	1	250	250
Clerical	3	250	750	4	250	1,000
Subtotal	4		1,000	5		1,250
Photocopy						
Technician	1	250	250	1	250	250
Clerical	2	100	200	2	100	200
Subtotal	3		450	3		450
Shipping and Receiving						
Clerical	3	300	900	4	300	1,200
Storage	—	—	1,000	—	—	1,200
Subtotal	3		1,900	4		2,400
Office Support						
Conference Room	15	25	375	15	25	375
Staff Room	25	25	625	25	25	625
Supply Room	—	—	300	—	—	300
Subtotal	40		1,300	40		1,300
Total Staff and Service	67*		11,010	87*		14,290

*Excludes conference and staff room Stations.

9. Determine the increment of other types of service space required that are not directly staff generated (e.g., public catalog, display, waiting, and storage space)

Assignable Square Feet of other service space = 5% × [Sum of stack, reader, and staff areas]

Planning Stage I

= (.05) × [(28,116) + (45,850) + (11,010)]
= (.05) × (84,976)
= 4,249

Planning Stage II

= (.05) × [47,214) + (88,350) + (14,290)]
= (.05) × (149,854)
= 7,493

10. If an existing library is to be expanded, determine the types of existing space that will remain in continued use at each planning stage, and subtract it from the total projected Assignable Square Feet of each type to determine the additional space needed.

TABLE 30

SUMMARY OF PROJECTED LIBRARY SPACE REQUIREMENTS

(1)	(2)	(3)	(4)	(5)
		Assignable Square Feet		
	Stacks	Readers	Staff and Service	Total
Planning Stage I	28,116	45,850	11,010	84,976
Add 5% General Area*	—	—	4,249	4,249
Total: Stage I	28,116	45,850	15,259	89,225
Less Existing in Continued Use	22,000	10,200	7,140	39,340
Additional Required	6,116	35,650	8,119	49,885
Planning Stage II	47,214	88,350	14,290	149,854
Add 5% General Area*	—	—	7,493	7,493
Total: Stage II	47,214	88,350	21,783	157,347
Less Existing in Continued Use	22,000	10,200	7,140	39,340
Additional Required	25,214	78,150	14,643	118,007

*Includes public catalog, display, storage, and similar general service areas.

Section 2.2.

General Method

LIBRARY FACILITIES

INTRODUCTORY COMMENTS

For a quick evaluation of existing library facilities or for long-range projection of ibrary facility requirements, more generalized methods are useful. Generalized ibrary space factors should be applied with a clear understanding that they are broad averages which may obscure important variations appropriate for a particular institutional library. The general factors which are used should be based on a detailed analysis of the particular library. When such factors are borrowed from other institutions (or imposed by state agencies) their origin and assumptions should be fully understood.

The general methods are applied to the three basic library space types:

1. Stack facilities housing library collections
2. Reader facilities
3. Staff and service facilities

In evaluating or projecting stack facilities, the methods illustrated here are based on bound volumes only so that the factors must incorporate allowances for other types f library materials.

For reader Station requirements, the general methods use a single proportion of reader Stations per 100 FTE Students; hence, allowance must be made for faculty and public users. A single average of floor space per reader Station is used and must allow for variation in the types of reader Stations.

Library staff and service space may be estimated either as a percentage of the calculated stack and reader space or, preferably, by using the general methods for estimating office space requirements from Manual Three plus an increment for nonoffice service facilities.

Discussion and Example sections have been written for evaluating current library space as well as for projecting future library needs.

Section 2.2.1

General Method

EVALUATION OF EXISTING LIBRARY FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- Capacity of existing library stacks to accommodate existing library materials
- Capacity of existing library reader facilities to serve the existing reader populations
- Capacity of existing library staff and service facilities to accommodate existing staff and service requirements

PROGRAM DATA REQUIRED

- Existing size of the library collection in bound volumes (or equivalent)
- Existing reader population (expressed as Full-Time Equivalent or headcount Students) being served by library facilities
- Existing number of library staff requiring office and work Station space

FACILITIES DATA REQUIRED

- Existing Assignable Square Feet of stack space including the floor area in open-stack reading rooms allocated to stacks
- Existing Assignable Square Feet of reader space including floor area in open-stack reading rooms allocated to reader Stations
- Existing total number of reader Stations
- Existing Assignable Square Feet of office, office service, library processing, and study facilities service space
- Existing total number of staff office and work Stations

UTILIZATION ASSUMPTIONS REQUIRED

- Stack density criterion expressed as bound volumes (or equivalent) per Assignable Square Foot of library stack space
- Percentage of FTE Students to be provided with library reader Stations
- Average number of Assignable Square Feet per reader Station
- Average Assignable Square Feet per library staff member requiring office or work Station space

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

    - Existing Assignable Square Feet of stack space including the floor area in open-stack reading rooms allocated to stacks
    - Existing Assignable Square Feet of reader space including floor area in open-stack reading rooms allocated to reader Stations
    - Existing total number of reader Stations
    - Existing Assignable Square Feet of office, office service, library processing, and study facilities service space
    - Existing total number of staff office and work Stations

    The facilities data for this general procedure need only be in general, aggregate terms. Should these procedures indicate that, in general, the library capacity is not sufficient, then the planner should rely on the procedures set forth in Section 2.1. for a more detailed evaluation of library capacity.

2. Obtain the program data.

   - ►Existing size of the library collection in bound volumes (or equivalent)
   - ►Existing reader population (expressed as Full-Time Equivalent or headcount Students) being served by library facilities
   - ►Existing number of library staff requiring office and work Station space

3. Establish utilization rates as a matter of institutional policy.

   - ►Stack density criterion expressed as bound volumes (or equivalent) per Assignable Square Foot of library stack space
   - ►Percentage of FTE Students to be provided with library reader Stations
   - ►Average number of Assignable Square Feet per reader Station
   - ►Average Assignable Square Feet per library staff member requiring office or work Station space

   Utilization rates for these general methods must be the result of careful consideration. Although aggregate assumptions will suffice, they must clearly state which considerations are included and which are excluded.

4. Calculate the capacity of existing stack space.

   The capacity is found by multiplying the total Assignable Square Feet allocated to stack space by the stack density criterion.

5. Compare the calculated bound-volume capacity with the existing number of bound volumes.

   The result of this comparison will be an indication of excess or deficient capacity in terms of the assumed stack density criterion. An additional piece of information concerning the capacity of existing facilities may be obtained if one assumes a projected average rate of library acquisitions in terms of net bound volumes (or equivalent) added per year. By dividing this assumed acquisition rate into the existing excess capacity, an indication of the number of years required to reach that capacity is obtained.

6. Calculate the percentage of existing reader Stations to the current FTE Student enrollment and compare with the criterion for the desirable number of reader Stations as a percentage of the FTE Student enrollment (or headcount).

   The capacity of existing library reader facilities to serve the existing reader population will be indicated by the comparison of these percentages. For existing capacity to be satisfactory, the existing percentage of FTE Students who are provided reader Stations should be equal to or greater than the assumed percentage.

7. Calculate the amount of Assignable Square Feet of staff and service space required for existing staff.

   This is done by multiplying the current number of staff requiring office or work Station space by the average Assignable Square Feet per library staff member requiring office or work Station space.

   In some cases, this step may be simplified even more by assuming library service space to be a percentage of the sum of the stack and reader floor area.

8. Compare the required service area with the existing service area.

   Relative capacity of the existing library staff and service facilities to accommodate existing staff and service requirements will be shown by an excess or deficit of space when the comparison is made.

9. Summarize the results.

   A summary of the individual evaluations can be very helpful, particularly in respect to any indicated imbalances in the stack space, reader space, and staff and service space and in respect to any indicated excess of one type of library space which might be converted to meet an indicated need for another type (e.g., convert stack space to reader space, or vice versa) before it will become necessary to expand the existing library facilities.

COMMENTS ON THE PROCEDURE

The foregoing General Method for the evaluation of existing library facilities provides a gross indication of current library capacity. It is recommended that this analysis always be accompanied by the projection of library requirements at least five and preferably ten years into the future, so that the analysis of current facilities is put in the perspective of expected future growth.

Note: *It is assumed that faculty study Stations in the library are included in the total reader facilities. The institution may wish to evaluate faculty study space as a separate element.*

Section 2.2.1

General Method

EVALUATION OF EXISTING LIBRARY FACILITIES

EXAMPLE

DATA TO BE DETERMINED

- ►Capacity of existing library stacks to accommodate existing library materials
- ►Capacity of existing library reader facilities to serve the existing reader populations
- ►Capacity of existing library staff and service facilities to accommodate existing staff and service requirements

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   - ►Existing Assignable Square Feet of stack space including the floor area in open-stack reading rooms allocated to stacks = 22,000 ASF
   - ►Existing Assignable Square Feet of reader space including floor area in open-stack reading rooms allocated to reader Stations = 10,200 ASF
   - ►Existing total number of reader Stations = 332 Stations
   - ►Existing Assignable Square Feet of office, office service, library processing, and study facilities service space = 7,140 ASF
   - ►Existing total number of staff office and work Stations = 32 Stations

2. Obtain the program data.

   - ►Existing size of the library collections in bound volumes (or equivalent) = 180,000
   - ►Existing reader population (expressed as Full-Time Equivalent or headcount Students) being served by library facilities = 3,600
   - ►Existing number of library staff requiring office and work Station space = 42

3. Establish utilization rates as a matter of institutional policy.

   - ►Stack density criterion expressed as bound volumes (or equivalent) per Assignable Square Foot of library stack space = 12 bound volumes per ASF (0.083 ASF per bound volume)
   - ►Percentage of FTE Students to be provided with library reader Stations = 27% of FTE Students
   - ►Average number of Assignable Square Feet per reader Station = 33 ASF per reader Station
   - ►Average Assignable Square Feet per library staff member requiring office or work Station space = 220 ASF per library staff requiring office or work Station space

The factor of 12 bound volumes per ASF allows for a "low" mix of other nonbound types of library material. A high mix of microforms, periodicals, and special collections in a library would require a lower value of bound volumes per ASF, e.g., ten (the commonly used 0.10 ASF per volume). The allowance of reader Stations as a percentage of FTE Students includes an allowance for faculty and public users. The allowance of 33 ASF per reader Station averages the mix of Station types ranging from 25 ASF for table reader Stations to 50 ASF for faculty studies. The criterion for library staff and service space is an average of *all* office, work Station, office service, storage, public catalog, and other service areas per library staff member requiring office or work Station space.

4. Calculate the capacity of existing stack space.

$$\text{Capacity of existing stack space} = \text{(Assignable Square Feet of existing stack space)} \times \text{(Stack density criterion)}$$

$$= (22{,}000\ \text{ASF}) \times \left(12\ \frac{\text{bound volumes}}{\text{ASF}}\right)$$

$$= 264{,}000\ \text{bound volumes}$$

5. Compare the calculated bound-volume capacity with the existing number of bound volumes.

Bound-volume capacity	=	264,000
Existing bound volumes	=	180,000
Excess capacity		84,000

If one were to assume an average net acquisition rate of 28,500 volumes per year over the next few years, then the existing library capacity would be reached in less than three years (84,000 ÷ 28,500 = 2.98).

6. Calculate the percentage of existing reader Stations to the current FTE Student enrollment and compare with the criterion for the desirable number of reader Stations as a percentage of the FTE Student enrollment (or headcount).

$$\text{Existing reader Station percentage} = \frac{\text{(Existing library reader Stations)}}{\text{(Existing FTE Students)}} \times 100\%$$

$$= \frac{(332)}{(3600)} \times 100\%$$

$$= 9.2\%$$

The desired proportion (Step 3) is 27 percent.

(0.27) x (3,600) = 972 reader Stations. A deficiency of 640 reader Stations (all types) is indicated. Or, (972) x (33 ASF per Station) = 32,076 ASF, less 10,200 ASF existing reader space = a deficiency of 21,876 ASF.

7. Calculate the amount of Assignable Square Feet of staff and service space required for existing staff.

Required staff and service space = (Existing staff requiring office or work Station space) × (Average Assignable Square Feet per library staff)

= (42 staff) × (220 ASF per staff)

= 9,240 ASF

Note: *The existing ASF required for staff and service space (9,240 ASF) is 20 percent of the sum of the stack and reader space required (47,000 ASF). This is a typical ratio of staff and service space to the total stack and reader space. This type ratio may be used as a shortcut to calculating required office or work Station space.*

8. Compare the required service area with the existing service area.

Required staff and service space = 9,240 ASF
Existing staff and service space = 7,140 ASF
Deficiency = 2,100 ASF

9. Summarize the results.

TABLE 31

COMPARISON OF EXISTING LIBRARY SPACE WITH CURRENT REQUIREMENTS

(1) Library Function	(2) Existing ASF	(3) Current ASF Required	(4) Excess (Deficiency)
Stacks	22,000	15,000	7,000
Reader Space	10,200	32,076	(21,876)
Staff and Service	7,140	9,240	(2,100)
Total	39,340	56,316	(16,976)

The need for immediate planning for library expansion is clear. Since the example institution is planning a major expansion of its enrollments and its library collections, the choice of temporarily using stack space for staff or reader space is a difficult one. Expansion of the staff to service increased acquisitions, in addition to the existing shortage of staff space, indicates the need to utilize some of the unused stack space to accommodate staff. Within three years the stacks will be nearing full capacity, so only temporary relief is available in this building by the use of stack space for other functions.

Section 2.2.2

General Method

PROJECTION OF REQUIREMENTS FOR LIBRARY FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- Projected additional Assignable Square Feet of library stack space required
- Projected additional Assignable Square Feet of library reader space required
- Projected additional Assignable Square Feet of library staff and service space required

PROGRAM DATA REQUIRED

- Current library holdings in bound volumes (or equivalent)
- Current user population served by the existing library facilities
- Current library staffing
- Projected size of library collection in bound volumes (or equivalent) at each planning stage
- Projected reader population (expressed as Full-Time Equivalent or headcount Students) to be served by library facilities at each planning stage
- Projected library staff requiring office or other work Stations at each planning stage

FACILITIES DATA REQUIRED

- Existing Assignable Square Feet of stack space expected to be in continued use at each planning stage
- Existing Assignable Square Feet of reader space expected to be in continued use at each planning stage
- Existing Assignable Square Feet of staff and service space expected to be in continued use at each planning stage

UTILIZATION ASSUMPTIONS REQUIRED

- Stack density criterion expressed as bound volumes (or equivalent) per Assignable Square Foot of library stack space
- Percentage of FTE Students to be provided with library reader Stations
- Average number of Assignable Square Feet per reader Station
- Average Assignable Square Feet per library staff member requiring office or work Station space

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   - Existing Assignable Square Feet of stack space expected to be in continued use at each planning stage
   - Existing Assignable Square Feet of reader space expected to be in continued use at each planning stage
   - Existing Assignable Square Feet of staff and service space expected to be in continued use at each planning stage

2. Obtain the program data.

   - ►Current library holdings in bound volumes (or equivalent)
   - ►Current user population served by the existing library facilities
   - ►Current library staffing
   - ►Projected size of library collection in bound volumes (or equivalent) at each planning stage
   - ►Projected reader population (expressed as Full-Time Equivalent or headcount Students) to be served by library facilities at each planning stage
   - ►Projected library staff requiring office or other work Stations at each planning stage

   As is the case with facilities information, program data may be gathered in aggregate form. Neither current nor projected populations, holdings, or staff need be grouped by anything other than total figures.

   The projected size of the library collection may be found either by the process of estimating expected sizes at the planning stages or calculating it by the use of estimated growth rate factors.

3. Establish utilization rates as a matter of institutional policy.

   - ►Stack density criterion expressed as bound volumes (or equivalent) per Assignable Square Foot of library stack space
   - ►Percentage of FTE Students to be provided with library reader Stations
   - ►Average number of Assignable Square Feet per reader Station
   - ►Average Assignable Square Feet per library staff member requiring office or work Station space

   Once again, aggregate assumptions will suffice. For stack density criterion, however, the planner must take care to be explicit about how library materials other than bound volumes are to be accounted for. Furthermore, the assumed allowance for reader Station space must account for all of the various types of reader Stations.

4. Calculate the projected Assignable Square Feet of stack space required at each planning stage.

   The projected stack space is found by dividing the projected number of bound volumes by the floor area criteria for stack density.

5. Compare the projected Assignable Square Feet of stack space with the existing Assignable Square Feet of stack space expected to be in continued use at each planning stage.

   The result of the comparison will be the projected additional Assignable Square Feet of library stack space required at each planning stage.

6. Calculate the projected total number of reader Stations required at each planning stage.

   The number of reader Stations required at each planning stage is determined by multiplying the number of FTE Students by the percentage of FTE Students to be provided with reader Stations.

7. Calculate the projected Assignable Square Feet of reader space required at each planning stage.

   This can be done by multiplying the number of reader Stations required by the space allowance per reader Station.

8. Compare the projected Assignable Square Feet of reader space with the existing Assignable Square Feet of reader space expected to be in continued use at each planning stage.

   The result of this comparison will be the projected additional Assignable Square Feet of library reader space required.

9. Calculate the projected Assignable Square Feet of staff and service space required at each planning stage.

   Multiply the projected number of staff requiring office or work Station space by the average Assignable Square Feet per staff unit.

   As a simplified alternative to this step, the total amount of staff and service space can be calculated as a percentage of the sum of the projected stack and reader floor area.

10. Compare the projected Assignable Square Feet of staff and service space with the existing Assignable Square Feet of staff and service space expected to be in continued use at each planning stage.

    The result of this comparison will be the projected additional Assignable Square Feet of library staff and service space required.

Section 2.2.2

General Method

PROJECTION OF REQUIREMENTS FOR LIBRARY FACILITIES

EXAMPLE

DATA TO BE DETERMINED

- ►Projected additional Assignable Square Feet of library stack space required
- ►Projected additional Assignable Square Feet of library reader space required
- ►Projected additional Assignable Square Feet of library staff and service space required

PROCEDURE

1. Obtain the facilities data from the facilities inventory.

   ►Existing Assignable Square Feet of stack space expected to be in continued use at each planning stage = 22,000 ASF

   ►Existing Assignable Square Feet of reader space expected to be in continued use at each planning stage = 10,200 ASF

   ►Existing Assignable Square Feet of staff and service space expected to be in continued use at each planning stage = 7,140 ASF

   Total = 39,340 ASF

2. Obtain the program data.

   ►Current library holdings in bound volumes (or equivalent) = 180,000 bound volumes

   ►Current user population served by the existing library facilities = 3,600 FTE

   ►Current library staffing = 42

   ►Projected size of library holdings in bound volumes (or equivalent) at each planning stage
   - Planning Stage I = 340,000 bound volumes
   - Planning Stage II = 590,000 bound volumes

   ►Projected reader populations (expressed as Full-Time Equivalent or headcount Students) to be served by the library facilities at each planning stage
   - Planning Stage I = 6,000 FTE
   - Planning Stage II = 10,000 FTE

   ►Projected library staff requiring office or other work Stations at each planning stage*
   - Planning Stage I = 67 staff
   - Planning Stage II = 87 staff

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*Projected library staff requiring office or other work Stations at each planning stage may be determined strictly on the basis of proportions as shown in Table 32.

TABLE 32

PROJECTED LIBRARY STAFFING REQUIREMENTS

(1)	(2)	(3)
	Ratio of Staff Units per 100 FTE Students	Number of Staff Units Required
Existing	1.17	42
Planning Stage I	1.12	67
Planning Stage II	0.87	87

3. Establish utilization rates as a matter of institutional policy.

►Stack density criterion expressed as bound volumes (or equivalent) per Assignable Square Foot of stack space	= 12 bound volumes per ASF or 0.087 ASF per bound volume
►Percentage of FTE Students to be provided with library reader Stations	= 27 percent of FTE Student enrollment
►Average number of Assignable Square Feet per reader Station	= 33 ASF
►Average Assignable Square Feet per library staff member requiring office or work Station space	= 220 ASF per staff member

4. Calculate the projected Assignable Square Feet of stack space required at each planning stage.

TABLE 33

PROJECTED LIBRARY STACK REQUIREMENTS

(1)	(2)	(3)
	Projected Number of Bound Volumes	Stack Space ASF*
Planning Stage I	340,000	28,330
Planning Stage II	590,000	49,170

*Column 3 = column 2 ÷ by 12 bound volumes per ASF.

Note: *Compare these General Method projections for Planning Stages I and II with those in the Detailed Method Example in Section 2.2.1, Table 10. The values are approximately the same in Planning Stage I, but the mix of material in the Detailed Method projection for Planning Stage II has changed, and the General Method projection results in a higher number of ASF required at Planning Stage II.*

5. Compare the projected Assignable Square Feet of stack space with the existing Assignable Square Feet of stack space expected to be in continued use at each planning stage.

		Stage I	Stage II
Projected Assignable Square Feet of stack space	=	28,330	49,170
Existing Assignable Square Feet of stack space expected to be in continued use	=	22,000	22,000
Projected additional Assignable Square Feet of library stack space required	=	6,330	27,170

6. Calculate the projected total number of reader Stations required at each planning stage.

TABLE 34

PROJECTED LIBRARY READER STATION REQUIREMENTS

(1)	(2) Projected FTE Students	(3) Total Number of Reader Stations*
Planning Stage I	6,000	1,620
Planning Stage II	10,000	2,700

*Column 3 = column 2 × 0.27.

Note: *Evaluation of this projection may indicate that the ratio of reader Stations to FTE Students at the later planning stages is higher than necessary; this will depend on an evaluation of the nature of the academic program and future expectations of library utilization. Such an evaluation is essential in setting institutional planning policy criteria.*

7. Calculate the projected Assignable Square Feet of reader space required at each planning stage.

TABLE 35

PROJECTED LIBRARY READER SPACE REQUIREMENTS

(1)	(2) Projected Number of Reader Stations	(3) Total ASF of Reader Station Space*
Planning Stage I	1,620	53,460
Planning Stage II	2,700	89,100

*Column 3 = column 2 × 33 ASF.

8. Compare the projected Assignable Square Feet of reader space with the existing Assignable Square Feet of reader space expected to be in continued use at each planning stage.

		Stage I	Stage II
Projected Assignable Square Feet of reader space	=	53,460	89,100
Existing Assignable Square Feet of reader space expected to be in continued use	=	10,200	10,200
Projected additional Assignable Square Feet of library reader space required	=	43,260	78,900

9. Calculate the projected Assignable Square Feet of staff and service space required at each planning stage.

TABLE 36

PROJECTED LIBRARY STAFF AND SERVICE SPACE REQUIREMENTS

(1)	(2) Number of Staff Units	(3) Total ASF of Staff and Service Space*
Planning Stage I	67	14,740
Planning Stage II	87	19,140

*Column 3 = column 2 × 220 ASF.

Note: *The General Method values are lower than the values obtained through use of the Detailed Method, since overall average used in the General Method does not reflect the changing mix of staff and service space requirements that is accounted for in the Detailed Method.*

10. Compare the projected Assignable Square Feet of staff and service space with the existing Assignable Square Feet of staff and service space expected to be in continued use at each planning stage.

		Stage I	Stage II
Projected Assignable Square Feet of staff and service space	=	14,740	19,140
Existing Assignable Square Feet of staff and service space expected to be in continued use	=	7,140	7,140
Projected additional Assignable Square Feet of library staff and service space required	=	7,600	12,000

TABLE 37

Summary of Projected Additional Assignable Square Feet of Library Space Required at Each Planning Stage

(1)	(2)	(3)
	Stage I	Stage II
Projected Additional Assignable Square Feet of library stack space required	6,330	27,170
Projected Additional Assignable Square Feet of library reader space required	43,260	78,900
Projected Additional Assignable Square Feet of library staff and service space required	7,600	12,000
Total	57,190	118,070

Section 2.3.

Libraries

UNIT FLOOR AREA CRITERIA

LIBRARY SPACE FUNCTIONS

Stack space, reader space, staff and service space

ROOM TYPES

Study room, stack, open-stack reading room, library processing room, study facilities service, office, office service

DISCUSSION

Library unit floor area criteria generally are related to the library space functions of stack, reader, and staff and service space. The unit floor area values vary widely with the type and density of stack shelving, the types of reader Stations, and the composition and processing operations of staff and service functions. Metcalf's exhaustive reference work containing actual layout studies for library planning and design provides a basic resource that will not be duplicated here.*

The unit floor area criteria illustrated below are drawn from a variety of sources and from the experience of the authors and various members of the project task force.

1. Stack Unit Floor Area Criteria

   Table 38 illustrates, in ranges, values of average bound volumes per Assignable Square Foot (and, conversely, Assignable Square Feet per bound volume) frequently used for different types of stacks.

TABLE 38

GENERAL UNIT FLOOR AREA CRITERIA FOR STACKS

(1) Type of Stack Area	(2) Average Bound Volumes per Assignable Square Foot	(3) Average Assignable Square Feet per Volume
Open-Stack Reading Rooms	8 — 10	0.125 — 0.10
Open Stacks	10 — 12	0.10 — 0.083
Closed Stacks	12 — 15	0.083 — 0.067
High Density Compact Storage	40 — 60	0.025 — 0.017

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*Keyes D. Metcalf, *Planning Academic Research Library Buildings* (New York: McGraw-Hill, 1965). See the other references footnoted in Section 1. of this manual.

It should be emphasized that these are averages and that special conditions may require considerable variation. Note also that these values are based on the use of *bound volumes* for the calculation of stack floor area. The values ranging from 10 to 15 bound volumes per ASF also allow for other types of materials.

For criteria more specifically related to types of library materials, the University of California Unit Area Allowances for Libraries are most useful.*

TABLE 39

UNIVERSITY OF CALIFORNIA UNIT AREA ALLOWANCES FOR LIBRARY STACKS

(1) Type	(2) Unit	(3) ASF per Unit
Stacks (Unit = single-face section)		
Books	Section = 125 Volumes	8.7
Documents and Pamphlets, Including Archives	Section = 1,000 Items	8.7
Microfilm (Boxed)	Section = 400 Reels	8.7
Microprint (Boxed)	Section = 10,000 Cards	8.7
Newspapers: Unbound-Display *	Section = 7 Titles	8.7
Newspapers: Back Files *	Section = 9 Volumes	8.7
Periodicals: Unbound-Display	Section = 15 Titles	15.0
Periodicals: Boxed	Section = 30 Titles	8.7
Recordings	Section = 500 Records	8.7
Reference	Section = 75 Volumes	15.0
Alternates to Stacks		
Maps	Case = 1,000 Maps	42
Microfilm (Reels)	Case = 400 Reels	11
Pamphlets	Case = 1,000 Pamphlets	11
Slides: Bound	Case = 5,000 Slides	17
Slides: Unbound	Case = 10,000 Slides	17

2. Reader Station Unit Floor Area Criteria

Reader Station unit floor area criteria depend heavily on the type of reader Station, the design of the furniture, and the allowances for internal circulation. The values in Table 40 illustrate commonly used ranges of Assignable Square Feet per reader Station by type of Station.

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*University of California, Office of the President, *University of California Planning Guide for Libraries: Unit Area Allowances.* Mimeographed. (Berkeley: May 24, 1968.) The stack types marked (*) are unit amounts representing one-half the required double-face section.

TABLE 40

UNIT FLOOR AREA CRITERIA FOR READER STATIONS

(1) Type of Station	(2) Assignable Square Feet per Station
Open Tables and Chairs	20 — 25
Small Carrels	25 — 30
Research Carrels (Open)	30 — 35
Enclosed Studies (Faculty)	40 — 70
Microform and Audio/Visual Carrels	35 — 45
Typing Stations (Multiple Stations in an Enclosed Room)	25 — 35
Reading Lounges	25 — 30
Conference Rooms, Seminar Rooms, and Small-Group Studies	20 — 25

Note: *Generally, the smaller the area of a study room, the larger the area per Station required due to the higher proportion of internal circulation space required in smaller rooms. The open table and chair type Station is not recommended except in reference areas.*

3. Staff and Service Space Unit Floor Area Criteria.

In general, staff and other service space should follow the approach described in Manual Three for office, office service, and other office-related facilities.

As a general guideline, the total staff and service facilities of a library may be expected to range from 25 percent (for a smaller library) to 18 percent (for a larger library) of the combined stack and reader floor area. However, this rule of thumb is not recommended for careful planning and evaluation of library service space requirements.

Table 41 gives the unit area allowances for staff work Stations developed by the University of California.

TABLE 41

UNIVERSITY OF CALIFORNIA UNIT FLOOR AREA CRITERIA FOR STAFF WORK STATIONS*

(1) Staff Work Areas	(2) Unit	(3) ASF per Unit
Acquisitions	Work Station	100
Administration	Work Station	120
Bindery Preparation	Work Station	250
Catalog	Work Station	110
Circulation	Work Station	120
Conference Room	Station	20
Data Processing (Including Equipment)	Work Station	120
Documents	Work Station	120
Gifts	Work Station	100
Interlibrary Loan	Work Station	100
Marking and Mending	Work Station	100
Periodicals	Work Station	120
Photocopy	Work Station	100
Receiving and Mail	Work Station	300
Reference	Work Station	120
Reserve Books	Work Station	100
Serials	Work Station	120
Special Collections	Work Station	120
Special Records	Work Station	120
Staff Room	Station	25
Typing Pool	Work Station	75

*Source: University of California, *op. cit.*

In the California approach, an *additional five percent* is added to the sum of all calculated stack, reader, and staff work Station floor areas to allow for additional service facilities such as lobby, public card catalog, patron waiting, display, and storage space. Some librarians feel that the California work Station allowances do not adequately provide for special equipment, files, and other space required for certain staff operations. In any case, these criteria are averages and may differ considerably in actual design.

Section 3.

AUDIO/VISUAL, RADIO, AND TELEVISION FACILITIES

ROOM TYPES INCLUDED

Audio/visual, radio, television facilities (production and distribution)
Audio/visual, radio, television facilities service

DISCUSSION

The use of audio/visual technology and radio and television instruction has greatly expanded in higher education in the past decade. Many experts believe that the potential of electronic media as learning aids has barely been tapped. Some envision that future developments of computer-assisted instruction, programmed learning with video and audio carrels, and the use of both closed-circuit and broadcast television will revolutionize traditional methods of instruction. Remote terminal access to computers and to audio and video tape libraries, indeed, may reduce greatly the amount of instruction conducted by the traditional lecture-discussion methods and disperse the locations of learning activity away from the central core of the traditional campus.

Although skeptical reaction to the early enthusiasm for television and other forms of audio/visual teaching has tempered the more glowing visions of automated learning, growth and development of programmed learning techniques and computer-assisted instruction will continue to have a major impact on the nature of college and university facilities in the future. Since the technology is still in a state of flux, it is extremely difficult to predict what the nature of this impact will be.

At present, the variation among institutions in terms of the types and amounts of audio/visual facilities required and the organization of such facilities covers an enormous range. Some institutions have developed large, centralized audio/visual service centers. These centers are staffed with professional and technical personnel engaged in the production of audio/visual instructional materials, closed-circuit and broadcast television programming, and programmed learning systems. They maintain and distribute audio/visual equipment for campuswide and sometimes statewide use. Often they are responsible for the processing, maintenance, and distribution of large film and tape libraries. These installations require large amounts of space for studio production, film and tape reproduction, graphic arts services, equipment repair and maintenance, and storage of equipment and materials. In many cases, these facilities are used for instruction and research in the communications arts and learning processes as well as for providing audio/visual services to other instruction and public service programs.

Many institutions do not centralize audio/visual services, or they make only limited use of the technological teaching devices. Individual departments often control their own equipment.

As a result of these variations, no explicit methods and criteria can be applied to the evaluation and planning of audio/visual, radio, and television facilities. Such facilities must be programmed to the scope and scale of audio/visual service and instructional operations that the individual institution decides to develop and to the ways in which uch operations are to be organized.*

GENERAL PLANNING CONSIDERATIONS

The general steps to be taken in programming for audio/visual, radio, and television studios are as follows:

►Outline program policy

- Is a central audio/visual production and service facility desired?
- Are instructional facilities (lecture halls, classrooms, small groups, language laboratories, film-making, television and radio studios, and the like) to be included in the central facility?
- What is the market area for audio/visual services? Campus? Multi-campus? Statewide? National?
- To what extent will the audio/visual service engage in the production of instructional materials and radio and television programs?
- How is the service to be organized?

►Estimate staffing requirements

- What is the scope and content of services and production?
- How many and what kinds of professional and technical staff are required to operate the services and production operations?
- What are the clerical staff support requirements?

►Estimate media storage requirements

- What amounts of film, tape, slides, and other materials need to be stored, maintained, and retrieved?
- What amounts of equipment (projectors, recorders, etc.) must be stored during periods of low distribution and use?

►Determine equipment maintenance functions

- Will equipment be repaired and maintained by the audio/visual service or by outside contract?

►Specify production functions

- Will the audio/visual service engage in the production and reproduction of films, audio and video tapes, slides and other materials?
- Will graphic arts services be supplied?
- Will studio production of films, television programs, and radio programs be part of the service?

►Determine instructional functions

- Will the audio/visual facilities be used for training in communications arts and education?
- What are the relationships between the faculty and the audio/visual professional and technical staff?

The following publications of the Educational Facilities Laboratories are helpful in developing designs of specialized audio/visual facilities: *Instructional Hardware: A Guide to Architectural Requirements* (1970); *New Building on Campus: Six Designs for a College Communications Center* (Case Study No. 7); *Planning for Schools with Television: Design for ETV* (revised edition, 1968); see also University Facilities Research Center, *Space for Audio/Visual Large Group Instruction* (Madison, Wisconsin: December 1963).

These kinds of decisions must be quantified in terms of number of personnel, amounts of media to be stored, amounts of equipment of various types, and numbers of specia facilities such as studios, workrooms, darkrooms, and graphic arts workrooms.

1. *Office space* for professional and clerical personnel can be programmed as any other type of office space (see Manual Three). Technical personnel usually are housed in production and maintenance workrooms, but some may require office space.

2. *Media storage space* for films, tapes, slides, and other material can be programmed in much the same way as library stack storage (Manual Four, Section 2.), depending on types of shelving or casing needed.

3. *Equipment maintenance space* is essentially like an electronic repair shop; the amount of space required depends on the volume of work handled and the number of technicians required.

4. *Production space* will vary with the type of studios required. Motion picture production generally requires very large spaces and substantial amounts of service space for processing and editing. Television studios vary greatly in size, but they generally require large, high ceiling rooms plus large amounts of control and equipment space. Tape, film, and photographic reproduction facilities are largely determined by equipment. Graphic arts production can vary from a single drawing board to substantial floor area requirements for equipment and construction.

5. *Instructional facilities* oriented to audio/visual systems can be programmed in the same manner as classrooms, class laboratories, and special class laboratories (Manual Two). However, special consideration must be given to the design of instructional facilities equipped for audio/visual instruction, and substantial amounts of service space often are required for equipment, projection booths, an storage. If these kinds of instructional facilities are concentrated in an audio/visua center, learning center, or communications center, service facilities also can be concentrated, probably with some saving of space. If specialized audio/visua instructional facilities are dispersed in different parts of the campus, each facility must have at least a minimum amount of service and storage space in conjunction

   Because of the wide variety of forms and components that audio/visual facilities can take and because of the requirements imposed by technical considerations, such facilities must be the subject of specialized study and design. The State University of New York has developed a series of space design models for "Instructional Resource Centers" for different types and sizes of its campuses that are useful references for planning such facilities.

   The space projected is divided into three categories: Core Services, Instructiona Development, and Administration as defined in the development of the models below:

   (a) Core Services allows for the production of audio/visual materials related to television, photography, graphics, computer-assisted instruction, independen study systems, and electronic retrieval systems. It includes space for graphic photography labs; equipment and materials circulation; equipment main tenance; radio and television studios; shops; and storage.

   (b) Instructional Development Space allows for offices and workrooms for activi ties related to specific curriculum-oriented projects involving audio/visual staf and faculty.

(c) Administration Space provides offices and conference rooms for use in coordinating the total activity.

Table 42 shows the floor area requirements of the State University of New York models for three types of colleges with full-time equivalent enrollments in the ranges indicated.

TABLE 42

STATE UNIVERSITY OF NEW YORK INSTRUCTIONAL RESOURCE CENTERS MODELS*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Assignable Square Feet								
	Two Year Colleges			Arts & Sciences Colleges			University Centers		
Facility Function or Category	1 to 3,000 FTE	3,001 to 5,000 FTE	5,001 to 7,000 FTE	1 to 4,000 FTE	4,001 to 6,000 FTE	6,001 to 10,000 FTE	1 to 12,000 FTE	12,001 to 20,000 FTE	20,001 to 30,000 FTE
Core Service									
Graphics	800	800	800	800	800	1,200	1,600	2,000	2,400
Photography	600	800	1,020	800	1,020	1,020	1,200	1,400	1,600
Equipment and Materials Circulation	1,000	1,400	1,640	1,400	2,600	3,000	4,000	5,000	6,000
Equipment Maintenance	400	400	400	400	600	600	800	1,000	1,200
Studios	1,200	1,500	1,500	2,000	2,880	2,920	4,800	6,000	7,200
T.V. Audio Distribution	1,200	1,200	1,200	1,200	1,600	1,600	1,600	1,600	1,600
Audio Services and Radio	480	600	800	800	1,200	1,200	1,400	1,400	1,400
Shops and Storage	1,400	1,600	1,800	1,800	2,400	4,800	6,000	6,000	6,000
Administration	480	600	840	2,000	2,480	5,400	6,000	7,200	8,400
Instructional Development	540	860	1,000	1,000	1,100	1,260	2,520	2,520	2,520
Total Assignable Square Feet	8,100	9,760	11,000	12,200	16,680	23,000	29,920	34,120	38,320

*Source: State University of New York, Office of the Vice Chancellor for Campus Development, *Space Projection Criteria for Capital and Long Range Facilities Planning Purposes* (Albany, New York: 1970), p. 18 and Appendix A, Table IV.

Section 4.

MUSEUM, GALLERY, AND OTHER EXHIBITION FACILITIES

ROOM TYPES INCLUDED Exhibition facilities (e.g., museums and galleries), exhibition facilities service

DISCUSSION Museums, art galleries, and similar types of exhibition facilities generally are institutionally unique in size, content, and operation. Because of their unique characteristics, no particular methods or planning criteria are available which can be applied to all types.

Exhibition facilities are intended to serve as extensions of the instructional processes, providing visual and tactile experience with natural objects (geological, botanical, and zoological specimens), artifacts of ancient and modern human culture, and works of art. In varying degrees, college and university museums and galleries also serve the research and public service programs of the institution.

The basic functions of museums, galleries, and other exhibition facilities that determine space requirements are as follows:

1. *The curatorial function.* The selection, preparation, preservation, cataloging, and maintenance of collections requires professional staff (often members of the faculty) supported by technical and clerical assistance varying with the size and support of the program. Workroom, shop, and office space is required.

2. *The exhibition function.* The display of items in a museum or gallery usually requires a substantial amount of floor area to insure appropriate space for display cases and circulation areas and for proper lighting and viewing of displays (especially art collections). The selection, scheduling, constructing, and arranging of exhibits and displays from an institution's own collection and from borrowed collections also requires the availability of professional and technical staff. As a result, this function requires office space in addition to the exhibition facilities.

3. *The storage function.* The storage of collections can be a major, but widely varying, space consumer. Some institutions house worldwide collections of specimens, artifacts, and works of art. Shipping and receiving of materials then becomes a significant space requirement. In many cases, the museum houses collections that are heavily used in class laboratory work and in art and art history courses. Types of storage facilities vary widely, from card files which preserve plant specimens in envelopes to geological core drilling samples weighing several hundred pounds each. Valuable collections of paintings require vault-type storage for security, controlled temperature, and regulated humidity. When a shortage of storage space for collections develops, the question of storing obsolete and unused collections may arise. Generally, however, museum collections are hard to dispose of and requirements for storage facilities seem to grow continuously.

. *The research function.* Museum and art collections continue to be an important research resource in the natural sciences, anthropology and archeology, and in the fine arts. The taxonomic approach to the natural sciences, although not as significant as it once was, is heavily dependent upon comprehensive specimen collections. Research workspace for graduate students, faculty, and visiting scholars who need to be in close proximity to the collections often must be provided in a museum or gallery facility.

Within these general functions, the facilities required by museum, gallery, and other exhibition programs of an institution are dependent on the size, scope, and rate of growth of collections; the volume of institutional and public use of the facilities; and degrees to which curatorial and research functions are required.

As a final comment, it should be noted that the amount of exhibition space available at an institution may depend very much on the amounts and sources of funds provided for construction of facilities. No specific unit floor area criteria are applicable.*

See, however, the design model floor area criteria developed by the State University of New York, Office of the Vice Chancellor for Campus Development, *Space Projection Criteria for Capital and Long Range Facilities Planning Purposes* (Albany, New York: 1970), p. 19 and Appendix A, Table IX.

Section 5.

DATA PROCESSING AND COMPUTING FACILITIES

ROOM TYPES INCLUDED Data processing-computer facilities, data processing-computer facilities service

DISCUSSION Data processing and computing facilities in colleges and universities primarily serve three programs:

1. Instruction in data processing technology and computing science
2. Research
3. Institutional support, i.e., data processing services for administration, student services, library operations, and public service programs

In smaller institutions if a computer installation exists, it serves all three requirements. In larger institutions separate installations of various types and sizes may be found serving one type of operation; i.e., a system and staff dedicated primarily to instruction and research, a system and staff dedicated primarily to administrative (institutiona support) data processing, and sometimes one or more smaller installations serving particular programs of instruction and research. As large scale time-sharing and multiprocessing systems develop, many predict that even in large institutions a single centralized computing operation will develop with remote terminals and periphera input-output equipment serving all kinds of users.

Space requirements for data processing and computer facilities will vary widely with the size and type of equipment, staff patterns, user services provided, the degree o centralization, and the use of remote equipment.

In 1966 the National Academy of Sciences and the National Research Council published a comprehensive study entitled, *Digital Computer Needs in Colleges and Universities.* This report includes estimates of the Assignable Square Feet of space neede by four types of computer installations, varying with the size of the installation. Th study was based on the use of second-generation computing equipment. Althoug third-generation computers have been somewhat compacted by solid-state circuitr (also reducing mechanical air conditioning requirements), increased use of specialize peripheral equipment probably has offset the reduction in basic equipment size.

The four types of computer installations are generalized as follows (with some third generation examples substituted).

- ►Type A: Large, high-speed, large-memory computers (e.g., CDC 6400-6600 IBM 360/65-91, RCA Spectra 70, GE 600) with substantial technical support and user service staff.
- ►Type B: Medium-large, medium-high-speed, medium-memory compute (CDC 3300-3600, IBM 360/50, Burroughs 5500, GE 400, PD 10) with medium-large support and user service staff.
- ►Type C: Medium-small, medium-speed, medium-small memory compute (IBM 360/30-40, XDS SIGMA 3, GE 200) with medium-sma support and user staff.
- ►Type D: Small, low-speed, medium-small memory computers (e.g., IBM 113 or 1800, PDP 8, PDP 8A, NOVA, XDS 930) with small suppor and user service staff.

The National Academy of Sciences/National Research Council study recommended the building space allowances shown in Table 43 for each of these four types of installations.

TABLE 43

GENERAL ASSIGNABLE SQUARE FEET REQUIREMENTS IN COMPUTING CENTERS

Use	Assignable Square Feet			
	Type A	Type B	Type C	Type D
Computer Room	2,500	2,500	1,500	800
Maintenance Engineers	400	400	200	100
Storage and Duplicating	1,500	1,000	500	200
Ready Room	2,000	1,200	800	400
Dispatching Room	1,000	600	400	200
Keypunch Room	500	500	300	200
Auxiliary Equipment	500	500	200	100
Subtotal	8,400	6,700	3,900	2,000
Library	2,000	1,200	800	400
Conference Rooms*	1,200	800	400	200
Offices*	11,850	8,500	5,150	650
Subtotal	15,050	10,500	6,350	2,250
Total	23,450 ASF	17,200 ASF	10,250 ASF	4,250 ASF

*Should be planned according to staffing by the methods shown in Manual Three.

These allowances should be viewed as useful starting points for planning new computer or data processing facilities requirements. Actual programming, however, will depend upon more careful study and documentation of

Staff requirements:	Administrative and management, systems engineers, systems analysts, programmers, user programming advisers, machine operators, keypunch operators, clerical and secretarial support
Machine configuration:	Computer room, peripheral equipment
Storage requirements:	Disc, tape, and card storage; supply storage
User Facilities:	Desk space, locker space, keypunch and other peripheral equipment
Remote Installations:	Remote terminals, remote input-output systems, links to other computers
Other:	Equipment maintenance facilities, conference facilities, instructional facilities

Manufacturers of equipment usually provide machine configuration layouts and other pace planning aids. Staff offices, conference rooms, and instructional facilities can be programmed in the same manner as they are in other cases. Storage facilities must be rogrammed according to expected volume of tape, disc, card, and supply requirements. User facilities depend on the expected number of users and the extent to which user facilities will be remote from the central facility.

Computer and data processing facilities can be expected to change in the future, but the nature of change is difficult to predict. A major factor that may be anticipated i the development of massive electromagnetic information storage devices. Already mentioned is the probable increase in time-sharing and remote terminal systems. Interconnected networks of computer systems already are being planned. The planning of facilities for this type of changing technology requires careful attention to adaptability, avoiding the construction of costly fixed facilities that may be outmoded in future cycles of technological development.

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

MANUAL FIVE

GENERAL SUPPORT FACILITIES

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SECTION 1.

Introduction

GENERAL SUPPORT FACILITIES

INTRODUCTORY COMMENTS

Manual Five of the *Higher Education Facilities Planning and Management Manuals* describes the procedures for evaluating the use of and projecting the need for

1. Athletic/Physical Education Facilities
2. Residential and Dining Facilities
3. Student Health Facilities
4. Other Student Service Facilities
5. Physical Plant Facilities
6. Miscellaneous General Use and Special Use Facilities

It appears that Manual Five includes a rather inconsistent and heterogeneous grouping of facilities types. The disorder, however, is more apparent than real. With the exception of physical plant facilities, these types reflect an institution's method of providing for "creature comforts" and the whole range of the students' nonacademic institutional life. These facilities are amenable to a great deal of control and direction by institutional policy and decision-makers.

Space analysis and projective techniques for these types of facilities, generally, are functions of dollars available as well as load. In particular, planning for miscellaneous General Use and Special Use facilities is almost entirely dependent upon source and amount of funds available. Requirements for physical plant facilities depend upon the size of the institution and its general needs.

The techniques and procedures which are outlined and illustrated on the following pages will serve as general guidelines to the institutional planner.

SECTION 2.

Introduction

PHYSICAL EDUCATION AND ATHLETIC FACILITIES

ROOM TYPES INCLUDED

Gymnasiums, ice rinks, basketball courts, handball courts, wrestling rooms, swimming pools, indoor tracks, field houses, and the associated spectator seating and service areas.

DISCUSSION

The evaluation and projection of athletic/physical education facilities is a complex problem reflecting many circumstances: institutional philosophy, educational programs, level and sex of students, climatic conditions, urban vs. rural location, source and amount of capital funding, and so on.

The net effects of these circumstances vary in the extreme from one institution to the next. Some institutions have extensive physical education facilities while others have none. Some institutions provide such facilities only for recreational purposes; others use their facilities for physical education instruction, intercollegiate athletics, and intramural athletics in addition to the recreational activities.

Many types of space are classified as athletic/physical education facilities. In most cases, the athletic/physical education activities are so specialized that each type requires a very unique type of space. The swimming pool is used for swimming and water polo; the handball courts for handball and squash; the ice rink for skating and hockey. Even the *least* specialized type of athletic facility is used for only a very few different types of activities. As a result, the detailed procedures for evaluating current capacity of physical education facilities and for projecting future needs of such facilities are designed to deal with each specific type of space individually. Evaluation of the capacity of all physical education space as a single entity yields an answer which is so generalized as to be misleading.

Estimation of future requirements for physical education facilities is based on projection of the level of activity within each of the programs served by these facilities:

1. Physical education classes—formally organized and scheduled instructional activities
2. Intercollegiate athletics
3. Intramural athletics—formally organized recreational activities
4. Free-time recreational activities which are unscheduled and not formally organized

The planning process for these facilities may be either simple or complex, depending upon the variety of programs served.

In addition to the physical education oriented activities which occur in the facilities, other activities often generate additional demands.

In particular a gymnasium or field house is often forced to double as an auditorium for purposes of providing entertainment activities. It may also be used for course registration, administering final exams, and a myriad of other activities which require large floor areas and/or seating capacity.

Not only is there a wide variety of use for physical education facilities, but the level of activity shows a high degree of seasonal variation. When weather conditions are appropriate for outdoor activities, it is common for all programs to place a substantially reduced load on physical education facilities. Inclement weather normally generates a consistently greater need for all programs. This variation makes it necessary to evaluate current use and project future requirements on the basis of the combined peak loads of all programs.

As a final comment, it must be noted that the sex of participants places further limitations on the flexibility of use of physical education facilities. In most instances, it is necessary to either schedule the use by men separately from that by women or to provide completely separate facilities.

In the following pages, two different methods for evaluating the current use and for projecting future needs of physical education facilities are presented. First, a set of detailed procedures is presented, designed to evaluate and project the use of each of the various types of physical education space. Second, a general method is presented which is designed only to indicate general sufficiency of current space or to estimate total future needs.

SECTION 2.1.

Detailed Method

EVALUATION OF THE CAPACITY OF EXISTING PHYSICAL EDUCATION AND ATHLETIC FACILITIES

DISCUSSION

DATA TO BE DETERMINED

►Hours per week each type of physical education space is available to meet the requirements of each of the different programs for that type of space

►Number of individuals that can be accommodated each period tabulated by type of space and by program

PROGRAM DATA REQUIRED

►Current number of hours per week of formally organized activities scheduled in each of the different types of space

FACILITIES DATA REQUIRED

►Number of available rooms or "units" of each of the different types of physical education space

For example, the respective number of handball courts, basketball floors, general exercise rooms, indoor tracks, etc. Capacity of these facilities is more often determined by the rules of the game than by the floor area of the facilities. As a result, the most important facilities data requirement is often the number of rooms rather than areas.

UTILIZATION ASSUMPTIONS REQUIRED

For each type of physical education space

►Room Utilization Rate
►Expected number of Stations (participants) per room

It should be noted that the expected number of Stations (participants) per room can vary depending on the program using that room. For example, when the basketball court is used for intercollegiate athletics, the maximum number of users may be 20 or 25; when it is used for intramurals and physical education instruction, the number of users may be 40; and when used for free-time activities, the maximum number of users may be as high as 50 or 60. These variations must be recognized when the number of Stations is determined for each room.

PROCEDURE

1. Obtain from the facilities inventory a listing of the available physical education facilities.

   It should be noted that not all athletic/physical education facilities are included. Such facilities as outdoor tennis courts and tracks, football practice fields, baseball fields, soccer fields, and golf courses are excluded.

2. Establish as a matter of institutional policy a Room Utilization Rate for each room (number of hours of use per week).

   The Room Utilization Rate may well vary drastically from room to room. For example, facilities for which the presence of an attendant is required (such as swimming pools) may be available fewer hours per week than facilities for which an attendant is not required (such as handball courts).

3. Determine the number of persons who can use each room at one time by program.

   Programs in this case are recreation, physical education classes, intercollegiate athletics, and intramurals. The determination in this step is not particularly relevant for intercollegiate athletics since the number of participants is determined on the basis of different considerations (e.g., how many individuals "make the team"). For all other programs, this determination is very important.

4. Determine the number of hours per week that each room is currently set aside for the exclusive use of each of the programs.

   At most institutions the allocation of time to the various programs is quite rigid and is usually accomplished on a priority basis. A common approach is first to set aside specific hours for use for physical education instruction and for intercollegiate athletics. Next, the schedule for intramural activities is accommodated. Residual time is then apportioned to free-time recreational activities.

   There may be different patterns of use for different types of space (e.g., the intercollegiate athletics program places a much smaller demand on handball courts than on the basketball courts). It should also be noted that use patterns vary seasonally. As a result, the determination of number of hours of use per week for each of the different rooms must be based on a period of peak use (normally the use patterns prevailing in the winter months), provided these peaks are necessary and cannot be spaced over time.

5. Determine the number of Weekly Student Hours (Weekly User Hours)* for each program which can be accommodated by each type of space (each room).

   For intercollegiate athletics, this measure is usually of little significance since the number of users is determined by other considerations (e.g., how many "make the team"). For the other programs, however, the maximum number of Weekly User Hours is a significant measure and is calculated by multiplying the number of hours per week the room is available for use by that program times the number of individuals in the program that can be accommodated at one time.

COMMENTS ON THE PROCEDURE

As part of the evaluation of existing capacity, it is necessary to assess the adequacy of existing service facilities (showers, lockers, etc.). This evaluation is made by the institutional decision-maker largely on a subjective basis.

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*The term Weekly User Hours is used to reflect the fact that not all users of athletic/physical education facilities are students. Faculty, staff, and residents of the surrounding community may also be users of these facilities.

SECTION 2.1.

Detailed Method

EVALUATION OF THE CAPACITY OF EXISTING PHYSICAL EDUCATION AND ATHLETIC FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Hours per week that each type of physical education space is available to meet the requirements of each of the different programs for that type of space

►Number of individuals that can be accommodated each period tabulated by type of space and by program

PROCEDURE

1. Obtain a listing of the available physical education facilities from the facilities inventory.

TABLE 1

INVENTORY OF PHYSICAL EDUCATION FACILITIES

(1) Facility	(2) Units Available
1. Intercollegiate Basketball Arena	1 Court
2. Men's Gym — Basketball	1 Court — 4 Baskets
3. Men's Gym — Handball, Paddleball, Squash	6 Courts
4. Men's Gym — Swimming Pool	1 Pool — 6 Lanes
5. Women's Gym — Basketball	1 Court — 6 Baskets
6. Women's Gym — Exercise Room	1 Room — 8 Stations

2. Establish a Room Utilization Rate for each room as a matter of institutional policy.

TABLE 2

ROOM UTILIZATION RATE FOR PHYSICAL EDUCATION ROOMS

(1) Facility	(2) Hours of Use per Week
1. Intercollegiate Basketball Arena	15 Hours/Week
2. Men's Gym — Basketball	55 Hours/Week
3. Men's Gym — Handball, Paddleball, Squash	55 Hours/Week
4. Men's Gym — Swimming Pool	55 Hours/Week
5. Women's Gym — Basketball	45 Hours/Week
6. Women's Gym — Exercise Room	45 Hours/Week

3. Determine the number of persons who can use each room at one time by program.

TABLE 3

NUMBER OF PERSONS WHO CAN USE EACH ROOM BY PROGRAM

(1)	(2)	(3)
	Number of Persons Who Can Use at One Time	
Facility	Instruction	Recreation
1. Intercollegiate Basketball	2 Teams	N/A
2. Men's Gym — Basketball	40	60
3. Men's Gym — Handball, Paddleball, Squash	2 Per Court — Singles 4 Per Court — Doubles	2 Per Court — Singles 4 Per Court — Doubles
4. Men's Gym — Swimming	18	50
5. Women's Gym — Basketball	72	72
6. Women's Gym — Exercise Room	16	20

4. Determine the number of hours per week that each room is currently set aside for the exclusive use of each of the programs.

TABLE 4

RESERVED HOURS PER WEEK FOR PHYSICAL EDUCATION PROGRAMS

(1)	(2)	(3)
	Reserved Hours per Week	
Facility	Instruction	Recreation*
1. Intercollegiate Basketball Arena	15	N/A
2. Men's Gym — Basketball	20	35
3. Men's Gym — Handball, Paddleball, Squash	20	35
4. Men's Gym — Swimming Pool	16	39
5. Women's Gym — Basketball	20	25
6. Women's Gym — Exercise Room	20	25

*Assumed to be the residual after Instruction requirements are satisfied.

5. Determine the number of Weekly Student Hours (Weekly User Hours) for each program which can be accommodated by each type of space (each room).

TABLE 5

NUMBER OF WEEKLY STUDENT HOURS WHICH CAN BE ACCOMMODATED

(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Instruction			Recreation	
Facility	Number of Persons at One Time	Reserved Hours per Week	Weekly Student Hours (4)=(2)x(3)	Number of Persons at One Time	Reserved Hours per Week	Weekly Student Hours (7)=(5)x(6)
1. Intercollegiate Basketball	2 Teams	15	N/A	N/A	N/A	N/A
2. Men's Gym — Basketball	40	20	800	60	35	2,100
3. Men's Gym — Handball, Paddleball, Squash						
Singles	12	20	240	12	35	420
Doubles	24	20	480	24	35	840
4. Men's Gym — Swimming Pool	18	16	288	50	39	1,950
5. Women's Gym — Basketball	72	20	1,440	72	25	1,800
6. Women's Gym — Exercise Room	16	20	320	20	25	500

SECTION 2.2.

Detailed Method

PROJECTION OF REQUIREMENTS FOR PHYSICAL EDUCATION FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- Additional "units" of each type of physical education space (other than outdoor facilities) required

PROGRAM DATA REQUIRED

- Projected Weekly Room Hours and Weekly Student Hours of formally organized physical education instructional activities by type of space required

  The basic data for this projection are projections of enrollments in physical education courses.

- Projected Weekly Room Hours for each type of physical education space required to meet the needs of the intercollegiate athletic program
- Projected Weekly Room Hours and Weekly User Hours of intramural activities by type of space required

  This projection requires estimating the number of individuals who will be engaged in each of the intramural activities.

- Head-count students

FACILITIES DATA REQUIRED

- Number of available rooms or units of each of the different types of physical education space (other than outdoor facilities)

UTILIZATION DATA REQUIRED

For each type of physical education space

- Room Utilization Rate
- Number of individuals who can be accommodated at one time tabulated by program

PROCEDURE

1. Obtain a listing of all the physical education facilities currently available and establish a Room Utilization Rate for each facility.
2. Calculate (estimate) the total number of hours per week that each type of space must be made available for use by those programs which have formally organized activities.

   The procedures for determining number of Weekly Room Hours required varies from program to program.

   (a) **Intercollegiate Athletics**

   At most institutions certain of the physical education facilities are set aside for the exclusive use of the intercollegiate athletic program during a specific period each day (e.g., 3:00 to 7:00 p.m.). As a result, the number of Weekly Room Hours of each type of physical education space devoted to intercollegiate athletics is determined by an administrative decision and is not calculated on the basis of projected program data.

(b) **Physical Education Instruction Program**

There are two procedures commonly used to determine the number of Weekly Room Hours for each of the different types of physical education space required for the activities of the physical education instruction program.

First, since these facilities can be considered as laboratories for the physical education instructional program, procedures similar to those used in determining requirements for class laboratories are appropriate.

In summary these procedures require that

(1) Enrollments in physical education courses be projected for the planning year
(2) For each activity requiring each of the various types of space, the course enrollments be converted to Weekly Student Hours
(3) The Weekly Student Hours of instruction in each type of space be divided by the number of persons who can be accommodated at any one time

This computation yields the number of required Weekly Room Hours for each type of space.

Second, a particular block of time (e.g., 8:00 a.m. - 3:00 p.m. each day) can be set aside for the exclusive use of the physical education instructional program. This approach requires that a simple analysis be performed to determine whether the projected number of Weekly Student Hours in physical education courses can be accommodated within the time allotted.

(c) **Intramural Athletics**

Again, the Weekly Room Hours of each type of facility can be determined either on the basis of an administrative decision which serves to allot a particular block of time to this program or on the basis of a calculation much like that for the physical education instructional program. This calculation requires a projection of the number of Weekly User Hours of activity in each particular type of facility. [Such a projection could take the form of an assumption that there would be 20 teams participating in basketball and that these teams would play a game a week (10 games) with each game lasting approximately 90 minutes. The result is a requirement of 15 hours of use per week of a basketball court.]

By adding the requirements of these three programs, a total Weekly Room Hour load for each type of facility is obtained.

3. Calculate the number of Weekly Room Hours currently available in each type of facility.

This calculation is accomplished by multiplying the number of units of each type of facility available (from the inventory) by the number of hours per week that facility is to be open (which is a utilization assumption concerning the Room Utilization Rate).

4. Calculate the Weekly Room Hours available for recreation uses.

This is accomplished by comparing the required Weekly Room Hours of each type of facility with the available Weekly Room Hours.

5. Calculate the number of Weekly User Hours of free-time recreational activities which can be accommodated.

When the requirements of the formally organized activities exceed the capacity of the available facilities, no free-time recreational activities can be accommodated. Where the Weekly Room Hours available exceed the requirements of the formally organized activities, the number of Weekly User Hours of recreational activities which can be accommodated is calculated by multiplying the number of hours remaining by the number of individuals that can be accommodated at one time.

6. Assess the requirements for additional facilities of each type.

   Having gone through the previous steps, two types of information are available.

   (a) Number of additional Weekly Room Hours required to meet the needs of the formally organized activities by type of facility
   (b) Number of Weekly User Hours of recreation activities which can be accommodated in each type of space in which the formally organized activities do not require all available hours

   On the basis of this information, the decision-maker must determine the additional number of units of each type of space which must be provided to satisfy the requirements of all programs. This means that the need of the formally organized activities must be met and an "acceptable" number of Weekly User Hours of recreational activities accommodated. Only the judgment of a knowledgeable individual can determine what is "acceptable" on any given campus.

COMMENTS ON THE PROCEDURE

Determining the additional requirements for each type of physical education space by no means assumes that these facilities can be provided. Physical education facilities, of necessity, are constructed in large increments. As a result, if the additional requirements are not sufficiently extensive to warrant construction of a major new facility, the institution will probably have to do without. In such a situation it is necessary to revise the programs which in combination place excessive demands upon certain of the physical education facilities. These revisions can take a variety of forms. The scope of any or all programs may be reduced or different space management techniques may be employed. Urban institutions may rent space or depend upon the community to supply needed facilities. Space management steps can be employed such as abandoning a policy of allotting specific time blocks to each program thereby obtaining greater flexibility in scheduling and the use of the space.

It should be indicated that this procedure represents just about the only procedure available for projecting requirements for physical education facilities with any degree of accuracy. Many institutions and agencies have used a factor of "Assignable Square Feet per FTE student" or "Assignable Square Feet per Weekly Student Hour of physical education instruction" as the basis for projecting the requirements for physical education facilities. However, such measures are extremely insensitive to many of the important determinants of the requirements for the various types of facilities. In reality, physical education facilities are extremely heterogeneous. Any projection techniques which do not recognize these differences can produce misleading results. Projecting requirements for all physical education facilities on the basis of a single factor is analogous to projecting the class laboratory facilities requirements for all academic departments on the basis of a single factor. The factor based on Weekly Student Hours is especially insensitive, since it not only uses a single figure for all types of space, but deals with only one of the many programs which use such facilities. As a result of these considerations, such procedures are not presented in these manuals.

As a final comment, it should be noted that the assessment of the need for additional facilities must include an assessment of the adequacy of the service facilities (particularly the locker and shower facilities).

SECTION 2.2.

Detailed Method

PROJECTION OF REQUIREMENTS FOR PHYSICAL EDUCATION FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Additional "units" of each type of physical education space (other than outdoor facilities) required

PROCEDURE

1. Obtain a listing of all the physical education facilities currently available and establish a Room Utilization Rate for each facility.

TABLE 6
INVENTORY OF PHYSICAL EDUCATION FACILITIES

(1)	(2)	(3)
Facility	Number of Units Available	Room Utilization Rate
1. Intercollegiate Basketball Arena	1 Court	15
2. Men's Gym — Basketball Court	1 Court — 4 Baskets	55
3. Men's Gym — Handball, Paddleball, Squash	6 Courts	55 Each
4. Men's Gym — Swimming Pool	1 Pool — 6 Lanes	55
5. Women's Gym — Basketball Court	1 Court — 6 Baskets	45
6. Women's Gym — Exercise Room	1 Room — 8 Stations	45

2. Calculate (estimate) the total number of hours per week that each type of space must be made available for use by those programs which have formally organized activities.

TABLE 7
TOTAL NUMBER OF HOURS PER WEEK THAT EACH TYPE OF SPACE MUST BE MADE AVAILABLE FOR FORMALLY ORGANIZED ACTIVITIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Weekly Room Hours Required for Each Activity					
Facility	Inter-collegiate Athletics	Intra-murals	Instruction Weekly Student Hours	Instruction Maximum Occupants at One Time	Instruction Weekly Room Hours (6)=(4)/(5)	Total Weekly Room Hours (7)=(2)+(3)+(6)
1. Intercollegiate Basketball Arena	15	N/A	N/A	N/A	N/A	15
2. Men's Gym — Basketball	N/A	18	1,000	40	25	43
3. Men's Gym — Handball, Paddleball, Squash	N/A	72	480 Doubles	4	120	222
			60 Singles	2	30	
4. Men's Gym — Swimming Pool	15	6	270	18	15	36
5. Women's Gym — Basketball	N/A	10	1,080	72	15	25
6. Women's Gym — Exercise Room	N/A	N/A	320	16	20	20
7. Women's Swimming*	N/A	4	180	18	10	14
8. Men's Wrestling, Tumbling, Exercise*	N/A	N/A	300	20	15	15

*Proposed new facilities.

3. Calculate the number of Weekly Room Hours (WRH) currently available in each type of facility.

TABLE 8

NUMBER OF WEEKLY ROOM HOURS AVAILABLE IN EACH FACILITY

(1) Facility	(2) Number of Units	(3) Room Utilization Rate*	(4) Total WRH Available (4)=(2)x(3)
1. Intercollegiate Basketball Arena	1	15	15
2. Men's Gym — Basketball	1	55	55
3. Men's Gym — Handball, Paddleball, Squash	6	55	330
4. Men's Gym — Swimming Pool	1	55	55
5. Women's Gym — Basketball	1	45	45
6. Women's Gym — Exercise Room	1	45	45

*From Table 6.

4. Calculate the Weekly Room Hours (WRH) available for recreation uses.

TABLE 9

WEEKLY ROOM HOURS AVAILABLE FOR RECREATION USES

(1) Facility	(2) WRH Available*	(3) WRH Required†	(4) WRH Available for Recreation Use (4)=(2)−(3)
1. Intercollegiate Basketball Arena	15	15	
2. Men's Gym — Basketball	55	43	12
3. Men's Gym — Handball, Paddleball, Squash	330	222	108
4. Men's Gym — Swimming Pool	55	36	19
5. Women's Gym — Basketball	45	25	20
6. Women's Gym — Exercise Room	45	20	25
7. Women's Gym — Swimming**	0	14	—14
8. Men's Gym — Wrestling, Tumbling, Exercise**	0	15	—15

*From Table 8
**Proposed new facilities
†From Table 7

5. Calculate the number of Weekly User Hours of free-time recreational activities which can be accommodated.

TABLE 10

WEEKLY USER HOURS OF RECREATIONAL ACTIVITIES WHICH CAN BE ACCOMMODATED IN EXISTING FACILITIES

(1) Facility	(2) WRH Available for Recreation Uses*	(3) Number of Users Who Can Use At One Time†	(4) Weekly User Hours Which Can Be Accommodated (4)=(2)x(3)
1. Intercollegiate Basketball Arena	N/A	N/A	N/A
2. Men's Gym — Basketball	12	60	720
3. Men's Gym — Handball, Paddleball, Squash	108	4	432
4. Men's Gym — Swimming Pool	19	50	950
5. Women's Gym — Basketball	20	72	1,440
6. Women's Gym — Exercise Room	25	20	500
7. Women's Gym — Swimming**	N/A	N/A	N/A
8. Men's Gym — Wrestling, Tumbling, Exercise**	N/A	N/A	N/A

*From Table 9
**Proposed new facilities
†From Table 3

6. Assess the requirements for additional athletic/physical education facilities.

This assessment requires evaluation of two points. First, is there a way to accommodate the formally organized activities for which there are no (or insufficient) facilities? Second, can sufficient Weekly User Hours of recreational activities be accommodated?

The analysis outlined in this example indicates that the formally organized activities can be accommodated in existing facilities except for women's swimming and men's wrestling, tumbling, and exercise. These are proposed new activities and no facilities are currently available for them. Women's swimming could be accommodated in the existing pool, but this would reduce to four the number of WRH available for recreational uses. This would, in turn, reduce the number of Weekly User Hours of recreational use to 200 (4 × 50).

There is need for a men's wrestling, tumbling, and exercise room. However, unless these activities can be accommodated in existing physical education space (e.g., in the intercollegiate basketball arena) or in some convenient and proximate space, it will probably be necessary to drop these activities. It is seldom feasible to construct physical education facilities in so small an increment. Dropping these activities from the instructional program would undoubtedly increase the use of other facilities, thereby decreasing their availability for recreational purposes.

Table 10 provides the basis for evaluating the sufficiency of facilities to accommodate recreational uses. This evaluation must be made by an institutional decision-maker and must reflect what is "adequate" at his particular institution.

COMMENTS ON THE PROCEDURE

The feasibility of accommodating the women's swimming program in existing facilities would be heavily influenced by the availability of adequate service facilities. Likewise, the ability to expand programs in existing facilities will also be controlled by the adequacy of the service facilities (e.g., locker and shower facilities).

SECTION 3.

Introduction

RESIDENTIAL AND DINING FACILITIES

INTRODUCTORY COMMENTS

Residential and dining facilities provide goods and services to a user group drawn from members of the campus community, usually in the absence of a suitable, alternative source of these goods or services. As a result, an important element in the planning of such facilities is the ability of the surrounding off-campus community to provide an alternate source for these services. The extent to which these types of facilities must be provided by the institution, therefore, is largely determined by factors outside of the institution's control.

Needs for the services provided through the auxiliary enterprise operations of an institution are common to all members of the campus community. The services are necessary because of the mere presence of individuals on the campus, not because of any particular characteristics of these individuals (e.g., major or student level). The planning processes for these types of facilities are considerably different from those for most other types of space. For example, economic considerations and the role of private enterprise in the provision of these services are especially important elements in these planning processes. The processes for projecting requirements for residential and dining facilities are discussed in the following sections.

SECTION 3.1.

RESIDENTIAL FACILITIES

ROOM TYPES INCLUDED

Residence halls for single persons, dormitories, one-family dwellings, multiple-family dwellings, and associated service facilities*

DISCUSSION

Residential facilities represent the largest single category of space at many institutions. Aggregate figures for all institutions in the United States indicate that residential facilities account for more than twice as many Assignable Square Feet of space as the next largest category (except, of course, in the public community colleges which generally have no facilities devoted to student housing). This fact alone lends considerable importance to the techniques used in projecting needs for such facilities and to the care with which these techniques are applied.

Fortunately, the procedures for estimating the requirements for residential facilities are relatively straightforward in comparison to those used to determine requirements for most other types of facilities. In addition, residential facilities represent one of the very few types of space for which there is normally a smaller penalty for having too little than for having too much. The consequence of vacant dormitory rooms may be financial disaster; the consequence of having too little dormitory space, although serious, means inconvenience to students who must find accommodations off campus. Hence, there is a natural tendency toward caution when the needs for additional residence hall space are being projected.

Differences in methodology represent variations in degree rather than kind. There is but one basic methodology for estimating requirements for residential facilities. Basically, this methodology consists of

1. Ascertaining the capacities of existing facilities
2. Estimating the number of students to be housed in the institution's residential facilities
3. Determining the additional number of units of each type required

The variations in the methodology are concerned with the extent to which subgroups of the student body are identified and used as the basis for planning. The same basic procedures apply when dealing with the broad categories "married students" and "single students" as when dealing with "single freshman females," "single graduate males," and other such specific groups within the student body.

It should be noted that the procedures for projecting future needs of residential facilities and evaluating their current use are couched almost exclusively in terms of number of Stations (or, more commonly, number of beds). This is not to say that data on the areas of residential facilities are not useful. Such data are particularly helpful in the space management process (e.g., which two-man rooms are sufficiently large to be used as three-man rooms should the need arise).

Because the procedures for new institutions and those for existing institutions are so similar, they are not discussed separately.

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*Offices in residence halls are considered to be offices and not service facilities.

†See Harold L. Dahnke and Paul F. Mertins, *Inventory of Physical Facilities in Institutions of Higher Education: Fall 1968* (Washington, D.C.: National Center for Educational Statistics, HEW-OE-NCES OE 51007-68, 1970).

SECTION 3.1.1

EVALUATION OF THE CAPACITY OF EXISTING RESIDENTIAL FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- ►Occupancy rates in the married student residential facilities
- ►Occupancy rates in each of the single student residential facilities

PROGRAM DATA REQUIRED

- ►Number of students currently assigned to each residential facility

FACILITIES DATA REQUIRED

- ►Design capacities of each of the existing residential facilities
- ►Information concerning type of occupants of each facility

PROCEDURE

1. Obtain a tabulation of the design capacities of each of the existing residential facilities.

The current capacity of each residential facility should be readily available from the institution's facilities inventory. Additional data regarding family dwelling units are required only if some of these units are to be reserved for use by individuals other than students. When such a situation prevails, it is necessary to know how many of the existing units will be available to house students.

With regard to single student residential facilities, care must be taken to insure that the inventory data reflect design capacities rather than the actual number of Stations provided at any given point in time. Discrepancies between design capacities and actual capacities may occur as a result of overassignment of rooms (e.g., assigning two students to a room designed for one). Any discrepancy which results in an overstatement of current capacity will, in turn, result in an understatement of future need.

For many institutions, however, the summary data on design capacity of single student residence halls which can be obtained from the inventory alone are *not* sufficient. At almost all institutions, housing policies call for providing residential facilities to students on the basis of certain definable student characteristics. The following is an illustrative but by no means exhaustive listing of some of these characteristics.

(a) Level of student (All freshmen may be required to live on campus.)
(b) Age and sex of student (All female students under 21 may be required to live on campus.)
(c) Student major (All foreign majors may be required to live in "language houses.")
(d) Involvement in extracurricular activities (All varsity athletes may be required to live in special dormitory facilities.)
(e) Membership in social organizations (Members of fraternities and sororities may be required to live in the facilities provided for these groups unless there is insufficient capacity.)

Obviously, the facilities assigned to each of these identifiable groups need not be tailored uniquely to the specific requirements of these groups. Freshmen and upperclassmen can use the same space. Spanish majors and varsity athletes can live in dormitories having exactly the same physical characteristics. A fraternity house could be assigned to students on the basis of their level as well as on the basis of membership in a social organization. A given dormitory normally can accommodate men as well as women. Men's dorms can be converted to women's dorms through the simple expedient of planting geraniums in the urinals.

Since the residential facilities do have interchangeable uses, it is impossible (or managerially unwise where it *is* possible) to categorize space rigidly in accordance with user characteristics. Admittedly, in some situations this rigidity is necessary. For example, an institution may be required by contract to provide a student group (e.g., a fraternity) with space in a particular facility as long as the group maintains a 90 percent occupancy factor. Similarly, the location of specialized equipment in a dormitory may discourage its use as anything other than a language house. Such restrictions are the exception rather than the rule, however.

In order to categorize single student residential facilities in a manner which accommodates variations of the planning process and also reflects the interchangeability of possible uses, it is suggested that categorization be based on the physical unit. That is, in some instances, the unit would be an entire dormitory; in other instances, the unit would be a wing or a floor of a building. At the extreme, a "unit" might be a single room.

To describe single student residential facilities according to this scheme, it is necessary to provide the following information:

- ►Name or other designation of the unit
- ►Design capacity (number of beds or number of units)
- ►Restrictions as to assignment

Generally, units for married students are not assigned on any basis other than the student's marital status. Capacity of married student units usually is classified according to the number of bedrooms available in the unit.

2. Determine the number of students currently assigned to each residential facility.

   At most institutions assignments to housing facilities are monitored on a more or less continuing basis. These data normally can be obtained from the student housing office with a minimum of difficulty.

3. Calculate the current occupancy rate for each residential facility.

   Determination of the current occupancy rates is a simple matter of dividing actual numbers of residents in each facility by the design capacity of that facility. Since it is sometimes possible to overassign residents in a particular facility, such calculations can yield occupany rates in excess of 1.0 at an institution faced with a shortage of housing.

   For married student facilities, occupancy rates are calculated by dividing the number of families living in the facilities by the number of residential units available.

SECTION 3.1.1

EVALUATION OF THE CAPACITY OF EXISTING RESIDENTIAL FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Occupancy rates in the married student residential facilities
►Occupancy rates in each of the single student residential facilities

PROCEDURE

1. Obtain a tabulation of the design capacities of each of the current residential facilities.

TABLE 11

DESIGN CAPACITIES OF EXISTING SINGLE STUDENT RESIDENTIAL FACILITIES

(1) Residential Facility	(2) Design Capacity in Beds	(3) Type of Occupant
1. Building 1 — Harpur	192	Single Males
2. Building 2 — Hale	140	Single Females
3. Building 3 — Hamilton	150	Single Males
4. Building 4 — Hanson	43	Foreign Language Majors
5. Building 5 — Sigma	44	Sigma Alpha Chi Fraternity
6. Building 6 — Beta	36	Beta Phi Fraternity
7. Building 7 — Pi	48	Pi Alpha Theta Sorority
TOTAL	653	N/A

TABLE 12

DESIGN CAPACITIES OF EXISTING MARRIED STUDENT RESIDENTIAL FACILITIES

(1) Facility	(2) Design Capacity in Units	(3) Type of Unit
Dawn Apartments	50	10 — Efficiency 20 — 1 Bedroom 15 — 2 Bedroom 5 — 3 Bedroom
TOTAL	50	N/A

2. Determine number of students currently assigned to each facility.
3. Calculate the current occupancy rate for each residential facility.

TABLE 13

OCCUPANCY RATES OF EXISTING SINGLE STUDENT RESIDENTIAL FACILITIES

(1) Residential Facility	(2) Design Capacity in Beds	(3) No. of Residents	(4) Occupancy Rates (4) = (3) ÷ (2)
1. Harpur Quad.	192	178	0.92
2. McKinney Quad.	140	150	1.07
3. Baird Hall	150	136	0.91
4. Westdyke Hall	43	37	0.88
5. Sigma House	44	39	0.90
6. Beta House	36	35	0.99
7. Pi House	48	51	1.08
TOTAL	653	626	0.96

TABLE 14

OCCUPANCY RATES OF EXISTING MARRIED STUDENT RESIDENTIAL FACILITIES

(1) Facility	(2) Design Capacity	(3) No. of Resident Families	(4) Occupancy Rates (4) = (3) ÷ (2)
Dawn Apartments	10 — Efficiency	10	1.00
	20 — 1 Bedroom	19	0.95
	15 — 2 Bedroom	15	1.00
	5 — 3 Bedroom	3	0.60
TOTAL	50 Units	47	0.94

COMMENTS ON THE PROCEDURE

A review of Tables 13 and 14 reveals that the single student residential facilities occupied by females are oversubscribed while those occupied by males are not fully utilized. In addition, three married student apartments are vacant. While it is probably not feasible to relieve crowding in the girl's dorms by making use of available space in the men's residence halls, it may be appropriate to assign single females to apartments. Such a solution further emphasizes the interchangeability of uses of residence facilities and the need for flexibility in the use of such facilities.

SECTION 3.1.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR RESIDENTIAL FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- ►Number of additional family units required
- ►Number of additional single student residence hall Stations (beds) required

PROGRAM DATA REQUIRED

- ►Statement of housing policy which specifies the various categories of students for whom space is to be provided
- ►Projected total number of students in each of the identified categories
- ►Proportion of married students who are married to other students

FACILITIES DATA REQUIRED

- ►Design capacity of each of the existing residential facilities
- ►Current type of occupant in each facility

JUDGMENTS REQUIRED

- ►Number of the existing family dwelling units to be available for use by married students
- ►Number of existing single student residence hall beds to be available for use by students
- ►Number of students in each of the identified categories who will require space in campus residential facilities

PROCEDURE

1. Obtain the appropriate outputs of the program planning and analysis procedures (discussed in Manual Six).

   - ►Projected number of married students
   - ►Projected number of single students categorized according to characteristics specified in the institution's statement of housing policy

2. Determine the number of students in each of the various categories to be housed in campus residential facilities.

   In most instances, not all of the students in each of the identified categories will be provided with campus residential space. This situation arises either as a result of off-campus availability of housing which is a satisfactory alternative to campus housing or because there are exceptions to almost all policies (e.g., "the institution will house all freshmen *except those who live with relatives*").

   In estimating the number of students in each category for whom campus housing is required, several critical variables must be considered and their impact carefully weighed. Among these variables are the following:

(a) The role of college-owned housing in relation to the overall academic goals and objectives of the institution

Many institutions remain dedicated to the concept that their academic objectives can best be accomplished through maintenance of a 24-hour-a-day learning environment. At these institutions, life in the residence halls is designed to compliment the formally organized academic processes. Such institutions may either require students to live on campus or may attempt to make institutionally owned housing such an attractive alternative that students will want to live on campus, even in the absence of a stated requirement.

(b) The nature of the institution's student body and their particular housing needs

Housing needs of students are affected by such factors as income levels and place of permanent residence of the students. These factors determine the ability of students to commute from home and to obtain housing at a cost within their economic means.

(c) The availability of housing for students in the surrounding community

This is perhaps the most difficult variable to analyze because of its many facets. First, it is necessary to estimate the number and type of off-campus housing units available for use by students. Second, it is necessary to evaluate the rental rate of this housing, *vis-a-vis* the student's ability to pay. Finally, it is becoming increasingly necessary to consider seriously the effects on the housing needs of nonstudents. Numerous examples have come to light in which dependence on off-campus housing for students has created acute housing shortages for particular subgroups of the community's residents.

As a result of such consideration, close cooperation between the college and the community must be maintained in order to minimize the possibility of a housing crisis for any segment of the population.

Evaluation of the effects of these variables on the demand for campus housing is a process unique to each institution. Planners and administrators at each institution must estimate the requirements for on-campus housing and must consider the factors mentioned in so doing. There are no specific tools to use nor procedures to follow.

3. Compare the number of available Stations with the projected number of required Stations to determine the additional number of units and beds required.

The estimates of the number of additional single student beds required should be subdivided in such a way as to indicate the specific groups for which the added space is required.

COMMENTS ON THE PROCEDURE

The wide variations in housing policies and local conditions which are found from institution to institution preclude a complete description of a detailed method for projecting an institution's residence hall requirements. Because so much depends on the institution's policies regarding the groups of students to be afforded housing accommodations as well as on the ability of the surrounding community to satisfy demands for housing, and because there is so little commonality with regard to these matters, the procedures can be described only generally. It is not feasible to recommend a specific format which predetermines each of the categories. It is intended that the general description of the detailed procedures, illustrated by an example, will provide sufficient insight into the methods to make them useful to institutional administrators.

As a matter of economic necessity residential facilities are added in fairly large increments. Accordingly, whenever the results of the described procedures indicate the need for relatively few additional beds or units to house a particular group of students, some alternative to constructing additional facilities is necessary. The following are among the most common alternatives.

1. The surrounding community may be asked to absorb those students who cannot be housed in campus facilities.
2. Additional beds can be moved into existing facilities, thereby exceeding the design capacity of the facility (and probably creating crowded conditions).
3. Students can be assigned to facilities not specifically designed for their use. For example, single students can be assigned to vacant married student facilities.

Finally, it should be noted that when determining the student capacity of existing residence halls, space is commonly reserved for faculty, visiting guests, dorm counselors, or individuals enrolled in short courses or special programs. It should be noted that occupancy rates can be expected to parallel enrollment patterns during the calendar year; that is, occupancy rates are normally highest in the fall term, decreasing in succeeding terms. The extent of this decrease governs the seriousness of the associated revenue loss. This phenomenon also is a factor which must be considered in determining the amount of housing the institution will provide.

SECTION 3.1.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR RESIDENTIAL FACILITIES

EXAMPLE

DATA TO BE DETERMINED

- ►Number of additional family units required
- ►Number of additional single student residence hall Stations (beds) required

PROCEDURE

1. Obtain the appropriate outputs of the program planning and analysis procedures.

- ►Projected number of married students
- ►Projected number of single students categorized according to characteristics specified in the institution's housing policy

TABLE 15

PROJECTED NUMBER OF STUDENTS BY MARITAL STATUS, SEX, AND LEVEL

(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Level			
Marital Status	Sex	Freshman	Sophomore	Junior	Senior	Total (7) = (3) + (4)+(5)+(6)
Married	Male	0	0	40	90	130
	Female	0	0	15	5	20
	Total	0	0	55	95	150
Single	Male	483	387	232	168	1270
	Female	398	259	166	157	980
	Total	881	646	398	325	2250
TOTAL	Male	483	387	272	258	1400
	Female	398	259	181	162	1000
	Total	881	646	453	420	2400

2. Determine the number of students in each of the various categories to be housed in campus residential facilities.

(a) **Married Students**

A survey of the surrounding community has disclosed 71 apartment units particularly well suited to married students. Moreover, historical data has indicated that approximately 10 percent of the married students were married to other students.

10% × 150 married students = 15 married students married
to other students

This represents (15/2 = 7.5) or 8 family units

The total number of family units to be housed is, therefore, 150 − 8 = 142.

If only 71 of these families can be housed in the surrounding community, then 71 (142 − 71) must be housed in campus facilities.

(b) **Single Students**

(1) Freshmen

Institutional policy requires that all freshmen not living with relatives must live on campus. It is estimated that 25 percent of the freshmen will live with relatives.

(0.75) × (483) = 363 freshmen males to be housed
(0.75) × (398) = 299 freshmen females to be housed
662 freshmen to be housed

(2) Upperclass students

A thorough analysis of the availability of housing in the surrounding community has resulted in a conclusion that no more than 1,100 students can be housed in private housing without causing serious dislocations in the local housing market. The 1,100 includes students living with relatives.

(2,250) − (1,100) = 1,150 single students to be housed

Of these 1,150 beds, 662 are required for freshmen, leaving a requirement of 488 beds for upperclassmen. Of these 488, it is estimated that 300 will be used by females and 188 by males.

The total number of single males to be housed is

363 freshmen
188 upperclassmen
551 single males
(rounded to 550)

The total number of single females to be housed is

299 freshmen
300 upperclassmen
599 single females
(rounded to 600)

3. Determine the additional number of units and beds required.

(a) Married students

Projected number of units required	71
Number of units available	50
Additional units required	21

(b) Single males

Projected number of beds required		550
Number of beds available		
Bldg. 1 — Harpur	192	
Bldg. 3 — Hamilton	150	
Bldg. 5 — Sigma	44	
Bldg. 6 — Beta	36	
Total Available		422
Additional beds required		128

(c) Single females

Projected number of beds required		600
Number of beds available		
Bldg. 2 — Hale	140	
Bldg. 4 — Hanson	43	
Bldg. 7 — Pi	48	
Total Available		231
Additional beds required		369

COMMENTS ON THE PROCEDURE

The calculations of additional beds required for single males and females reflect rather arbitrary assignments of existing facilities to particular uses (e.g., the use of the language house as a residence hall for females). Variations in the use of existing facilities will yield different requirements for additional beds for males and females (although the total requirement remains unchanged).

SECTION 3.1.3

General Method

PROJECTION OF REQUIREMENTS FOR RESIDENTIAL FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- Number of additional family units required
- Number of additional single student residence hall beds required

PROGRAM DATA REQUIRED

- Projected total number of married students
- Projected total number of single students

FACILITIES DATA REQUIRED

- Total number of family dwelling units currently available
- Design capacity of existing single student residential facilities

JUDGMENTS REQUIRED

- Number of family dwelling units to be available for use by married students
- Number of single student dormitory beds actually available for use by students
- Proportion of the married students to be housed on campus
- Proportion of the single students to be housed on campus

PROCEDURE

1. Obtain the appropriate outputs of the program planning and analysis procedures (discussed in Manual Six).

   - Projected number of married students
   - Projected number of single students

2. Estimate the proportions of both single and married students to be housed in institutionally owned facilities.

   The estimated proportions of married and single students to be housed are planning factors which combine information on student characteristics, availability of housing in the community, demand for campus residential facilities, institutional housing policies, and other relevant factors. These estimated proportions reflect current data adjusted to account for expected changes.

3. Calculate the number of students in each category to be housed.

   This calculation is accomplished by multiplying the projected number of students in each category by the estimated proportion of students in that category to be provided with housing accommodations.

4. Determine the additional number of family units and single student residence hall beds required.

   This procedure consists of subtracting the currently available number of Stations of each type from the projected required number of family units and single student residence hall beds.

COMMENTS ON THE PROCEDURE

A large number of planning methodologies, conceptually similar to the methods discussed but different in detail, lie between the extremes represented by the detailed and general methods. These procedures are more detailed than the general methods and less detailed than the detailed methods described but the only significant differences are variations in the number of categories of single students selected as the basis for planning. The most common additional differentiation is by sex of the student. Rather than estimating the requirements for all single students, the housing needs of the single female and single male students are estimated separately. Another common differentiation is by level of student, especially by undergraduate and graduate categories.

The unique requirements of each institution must dictate the categories selected for planning purposes. As with all such procedures, the fewer the number of categories which are used, the easier and, probably, the more accurate the overall planning estimates will be.

In the final analysis, the process for estimating residence hall requirements is a combination of procedures. At most institutions, a positive housing policy is associated with certain categories of students (e.g., single undergraduate females), while housing is provided for other categories of students (e.g., single graduate males) only if their requirements cannot be satisfied off campus. Regardless, the methodology is basically similar to that described previously. The minimum residential facilities requirements for housing those students to whom the institution has made a positive commitment are calculated first. Then the ability of the community to shelter the students for whom the institution would prefer not to provide housing is assessed.

SECTION 3.1.3

General Method

PROJECTION OF REQUIREMENTS FOR RESIDENTIAL FACILITIES

EXAMPLE

DATA TO BE DETERMINED

- ►Number of additional family units required
- ►Number of additional single student residence hall beds required

PROCEDURE

1. Obtain the appropriate outputs of the program planning and analysis procedures.

   ►Projected total number of married students = 150
   ►Projected total number of single students = 2,250

2. Estimate the proportions of both single and married students to be housed in campus facilities.

   (a) Fifty percent of the married students will be provided with campus housing.
   (b) Fifty percent of the single students will be provided with campus housing facilities.

3. Calculate the number of students in each of the two categories for whom housing is to be provided.

   (a) (0.50) × (150 married students) = 75 married students to be housed
   = 75 units
   (b) (0.50) × (2,250 single students) = 1,125 single students to be housed
   = 1,125 beds

4. Determine the additional number of family units and single student residence hall beds required.

TABLE 16

ADDITIONAL RESIDENTIAL STATIONS REQUIRED

(1) Student Category	(2) Projected Units or Beds Required	(3) Design Capacity of Existing Facilities	(4) Additional Units or Beds Required (4) = (2) − (3)
Married Students	75 Units	50 Units	25 Units
Single Students	1125 Beds	653 Beds	472 Beds

SECTION 3.2.

DINING FACILITIES

ROOM TYPES INCLUDED Food service facilities, food service facilities service, and dining facilities in dormitories

DISCUSSION The room type structure included in the *Higher Education Facilities Manual* makes a distinction between those dining facilities which are included as part of a dormitory complex (and generally restricted to use by residents of the associated dormitories) and those which are open to a wider clientele. For purposes of most analyses, this distinction is unnecessary. The procedures to be described on the following pages generally treat dining facilities without reference to the distinction. Where relevant, however, it will be recognized.

In general, the procedures require projection of the loads to be placed on the dining facilities and assessment of the ability of current facilities to accommodate this projected level of activity. If current facilities are found to be insufficient, these procedures will indicate the minimum additional number of dining stations required. However, efficiencies of operation normally are such that dining facilities are added in rather large increments. As a result, operational considerations commonly dictate the characteristics of the dining facility as it is eventually to be constructed. These procedures indicate *minimum* requirements which must be satisfied as of the time period for which the projection is being made.

As is the case with residential facilities, variations in the methodology are based on the extent to which specific clientele are identified and used as the basis for planning. All methodologies, however, are operationally and conceptually similar. Again, they vary in degree rather than in kind.

SECTION 3.2.1

EVALUATION OF THE CAPACITY OF EXISTING DINING FACILITIES

DISCUSSION

DATA TO BE DETERMINED

►Maximum number of diners that can be accommodated at each of the institution's dining facilities

PROGRAM DATA REQUIRED

►Average number of people served at each meal of the day

FACILITIES DATA REQUIRED

►Number of Stations in each of the institution's dining facilities

JUDGMENTS REQUIRED

►Number of turnovers* which can be achieved at each facility for each meal of the day

PROCEDURE

1. Obtain a tabulation of the number of dining Stations (designed seating capacity) in each of the institution's facilities.

   This tabulation should be readily obtainable from the institution's facilities inventory. Care should be taken to insure that the number of Stations reflects design capacity rather than some other factor.

2. Determine the number of turnovers for each dining facility for each meal of the day.

   Maximum number of turnovers is calculated by dividing the length of the serving period for each meal by the estimated shortest comfortable length of time an average individual normally requires to eat that meal. This estimation should be made in consultation with the director of dining facilities.

   It should be noted that the maximum number of turnovers which can be achieved is a function both of length of the serving period and of time required per diner. To some extent, both variables are controllable. For example, the time required per diner can generally be reduced if cafeteria service instead of table service is provided. Similarly, the length of the serving period is unnecessarily limited if the class schedule is constructed so as to force most students into a 12:00 to 1:00 lunch period.

   However, it must be recognized that, in all probability, it will be impossible to eliminate fluctuations in use and in the period of peak demand. As a result, it is usually necessary to reduce the number of turnovers to a figure somewhat less than obtained as a result of the calculation. Such changes must be based on the subjective judgments of experienced institutional administrators.

3. Calculate the capacity of each dining facility for each meal of the day.

   Capacity is obtained as the product of the number of turnovers and the number of dining Stations available (designed seating capacity) in each facility.

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*A turnover is defined as the maximum number of times each Station can be used during the serving of a single meal.

4. Obtain a record of the average number of people served at each meal of the day.

   The source for this information is the institution's director of dining facilities. These persons generally maintain rather complete and accurate records of people served.

5. Compare the calculated capacity with the current rate of use for each dining facility.

COMMENTS ON THE PROCEDURE

The capacity of a dining facility frequently is determined by the capacities of the service areas (kitchens and dishwashing rooms), as well as by the capacity of the dining area itself. As a result, an important element in evaluating the capacities of dining facilities is assessing the capacity of the service areas *vis-a-vis* the capacity of the dining areas.

SECTION 3.2.1

EVALUATION OF THE CAPACITY OF EXISTING DINING FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Maximum number of diners that can be accommodated at each of the institution's dining facilities

PROCEDURE

1. Obtain a tabulation of the number of dining Stations (design seating capacity) in each of the institution's dining facilities.

TABLE 17

DESIGN SEATING CAPACITY OF DINING FACILITIES

(1) Dining Facility	(2) Stations
Crosswell Hall	300
Harpur House	200
Sigma House	44
Beta House	36
Rathskeller	50
Pi House	48
TOTAL	678

2. Determine the number of turnovers for each dining facility for each meal of the day.

TABLE 18

MAXIMUM NUMBER OF TURNOVERS FOR EACH MEAL

(1) Meal	(2) Facility	(3) Length of Serving Period in Minutes	(4) Shortest Comfortable Eating Time* in Minutes	(5) Turnovers (Maximum)	(6) Turnovers (Adjusted)†
Breakfast	Crosswell Hall	75	20	3.75	3
	Harpur House	75	20	3.75	3
	Sigma House	45	30	1.5	1
	Beta House	45	30	1.5	1
	Pi House	45	30	1.5	1
	Rathskeller	0	0	0	0
Lunch	Crosswell Hall	120	30	4	3
	Harpur House	120	30	4	3
	Sigma House	45	45	1	1
	Beta House	45	45	1	1
	Pi House	45	45	1	1
	Rathskeller	150	15	10	8
Dinner	Crosswell Hall	120	45	2.67	2
	Harpur House	120	45	2.67	2
	Sigma House	60	60	1	1
	Beta House	60	60	1	1
	Pi House	60	60	1	1
	Rathskeller	0	0	0	0

*The variations in eating times reflect both the nature of the meal and the nature of the service.

†The adjustments reflect the existence of fluctuating demands and peak loads and are based on the subjective judgments of the institutional administrator.

3. Calculate the capacity of each dining facility for each meal of the day.

TABLE 19

CAPACITY OF EACH FACILITY FOR EACH MEAL

(1)	(2)	(3)	(4)	(5)
Meal	Facility	Stations	Turnovers	Calculated Capacity (5) = (3) x (4)
Breakfast	Crosswell Hall	300	3	900
	Harpur House	200	3	600
	Sigma House	44	1	44
	Beta House	36	1	36
	Pi House	48	1	48
	Rathskeller	50	0	0
	TOTAL	678	N/A	1,628
Lunch	Crosswell Hall	300	3	900
	Harpur House	200	3	600
	Sigma House	44	1	44
	Beta House	36	1	36
	Pi House	48	1	48
	Rathskeller	50	8	400
	TOTAL	678	N/A	2,028
Dinner	Crosswell Hall	300	2	600
	Harpur House	200	2	400
	Sigma House	44	1	44
	Beta House	36	1	36
	Pi House	48	1	48
	Rathskeller	50	0	0
	TOTAL	678	N/A	1,128

4. Obtain a record of the average number of people served at each meal of the day.

TABLE 20

AVERAGE NUMBER OF PEOPLE SERVED AT EACH MEAL OF THE DAY

(1)	(2)	(3)	(4)
	Average Number of Meals		
Facility	Breakfast	Lunch	Dinner
Crosswell Hall	510	540	570
Harpur House	406	413	421
Sigma House	38	43	43
Beta House	30	32	34
Pi House	41	43	45
Rathskeller	0	330	0

5. Compare the calculated capacity with the current rate of use for each dining facility.

TABLE 21

COMPARISON OF CALCULATED CAPACITY AND CURRENT RATE OF USE

(1)	(2)	(3)	(4)	(5)
Meal	Facility	Calculated Capacity	Current Use	Difference (5) = (3) − (4)
Breakfast	Crosswell Hall	900	510	390
	Harpur House	600	406	194
	Sigma House	44	38	6
	Beta House	36	30	6
	Pi House	48	41	7
	Rathskeller	0	0	0
	TOTAL	1,628	1,025	603
Lunch	Crosswell Hall	900	540	360
	Harpur House	600	413	187
	Sigma House	44	43	1
	Beta House	36	32	4
	Pi House	48	43	5
	Rathskeller	400	330	70
	TOTAL	2,028	1,401	627
Dinner	Crosswell Hall	600	570	30
	Harpur House	400	421	—21
	Sigma House	44	43	1
	Beta House	36	34	2
	Pi House	48	45	3
	Rathskeller	0	0	0
	TOTAL	1,128	1,113	15

SECTION 3.2.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR DINING FACILITIES

DISCUSSION

DATA TO BE DETERMINED	►Additional number of dining Stations required to serve the defined groups of users
PROGRAM DATA REQUIRED	►Projected number of individuals in each of the defined groups of users
FACILITIES DATA REQUIRED	►Number of Stations available (design seating capacity) in each of the institution's existing dining halls
UTILIZATION DATA REQUIRED	►Number of diners that can be served in each facility for each meal of the day
JUDGMENTS REQUIRED	►Estimated maximum proportion of the possible number of users of each dining facility who will, in fact, eat each of the meals offered during the day

PROCEDURE

1. Obtain estimates of the total number of individuals in each of the groups which have been identified as being served in the various dining facilities.

   This information should be available as a result of the program planning and analysis procedures found in Manual Six.

   Board policies at most institutions are such that the majority of the dining facilities are assigned for use by well-defined user groups. Some dining halls are restricted to use by residents of a particular dormitory complex; the dining areas in fraternity and sorority houses are used only by members of those houses; the faculty club is used only by faculty members and nonacademic professionals. In addition, one or more of the dining halls or snack bars commonly is made available for use by students who live off campus, employees, etc. The possible combinations of these arrangements are practically limitless; therefore, each institution must specify the user groups appropriate to its food service policies. As a minimum, these categories usually include dormitory residents (subdivided according to categories appropriate to use of existing dining facilities), students living off campus, faculty, and other employees.

2. Estimate the maximum proportions of each of the user groups who will place a demand on dining facilities for each meal of the day.

Seldom, if ever, do all possible users avail themselves of services provided at a dining hall at any given meal (especially breakfast). Fortunately, the food service managers at most institutions keep rather meticulous records of the number of persons served at each meal. In facilities which cater to both "contract board" and "cash customers," the information on the number of meals served is normally categorized to reflect this distinction.

At some institutions the proportions of possible users who appear for each meal may be quite high. In this case planning should be done on the assumption that all possible users will, indeed, use the facility. The "no-shows" provide a small planning margin of safety. At other institutions, these proportions may be relatively small. Construction of dining facilities sufficiently large to accommodate all possible users would result in excessive amounts of space under such conditions.

3. Calculate the estimated maximum number of users for each meal of the day.

   The estimated maximum number of users for each meal of the day is the product of the total number of users in each group (from Step 1) and the estimated maximum proportions of each group to use the dining facilities (from Step 2).

4. Compare total projected demand with total capacity for each meal of the day.

   Also compare the relationship between demand and capacity after each of the user groups has been assigned to particular dining facilities.

5. Determine those situations in which projected demand exceeds capacity and investigate alternative solutions.

   Construction of additional facilities is only one solution to the problem of insufficient capacity in one or more dining halls. If the *total* capacity is not exceeded by the total estimated demand, the solution may well be as simple as redistributing some of the potential users to dining halls other than those to which they would be assigned normally.

   A second solution is to attempt to reduce the demand. While this may not be feasible at many institutions, removal of strict board contract requirements, for instance, normally will tend to reduce the number of users.

   Operational changes can also be instituted in an attempt to create additional capacity in existing facilities. Lengthening the period of operation and changing the methods of serving to shorten the time required to serve each person are examples of such operational changes.

   Finally, construction of new facilities eventually may be required to solve the problem of insufficient capacity in dining facilities. Sufficient Stations must be provided to accommodate at least the projected excess demand. The number of Stations actually added depends on a wide variety of factors. Additional dining facilities may be provided in conjunction with a new dormitory complex. Accordingly, the capacity would be tailored to the number of residents rather than to the number of Stations required to satisfy the projected excess demand for the institution as a whole.

COMMENTS ON THE PROCEDURE

Throughout the discussion concerning existing dining facilities, capacity has been assumed to be determined by the number of dining Stations available and the frequency with which they can be used. However, the pragmatic considerations of kitchen and serving line capacities may be equally important. As a result, care must be taken to insure that capacities do not exceed those of the service space. Specifically, the opinion of the food service manager should be solicited before any capacity estimates are used for planning.

In addition, at some institutions, particularly community colleges, dining facilities serve several purposes. In particular, they often serve as study facilities or even as laboratories in conjunction with instruction pertaining to food service. As a result, it may not be possible to expand the serving hours without interference in these other uses. When facilities which have multiple uses become overcrowded, either additional dining areas must be constructed or new space to house one or more of the other functions must be added.

SECTION 3.2.2

Detailed Method

PROJECTION OF REQUIREMENTS FOR DINING FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Additional number of dining Stations required to serve the defined groups of users

PROCEDURE

1. Obtain estimates of the total number of individuals in each of the groups which have been identified as being served in the various dining facilities [shown in Table 22, columns 1 and 2].

   This information should be available as a result of the program planning described in Manual Six.

TABLE 22

ESTIMATED MAXIMUM NUMBER OF USERS FOR EACH MEAL OF THE DAY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Category of User	Projected No. in Category	Meal 1		Meal 2		Meal 3	
		Percent	No.	Percent	No.	Percent	No.
			(4)=(2)x(3)		(6)=(2)x(5)		(8)=(2)x(7)
Married Students	150	10%	15	40%	60	0%	0
Harpur Residents* Single Males	192	70%	135	95%	182	95%	182
Hale Residents Single Females	140	70%	98	95%	133	95%	133
Hamilton Residents Single Males	150	70%	105	95%	142	95%	142
Hanson Residents Single Females	43	100%	43	100%	43	100%	43
Sigma Alpha Chi Frat. Residents*	44	100%	44	100%	44	100%	44
Beta Phi Frat. Residents*	36	100%	36	100%	36	100%	36
Pi Alpha Theta Sor. Residents	48	100%	48	100%	48	100%	48
Other Residents Single Males†	138	70%	97	95%	131	95%	131
Other Residents Single Females†	359	70%	250	95%	341	95%	341
Off Campus Single Students	1,100	15%	165	65%	715	25%	275
Faculty, Staff, Guests, etc.	500	5%	25	35%	175	5%	25
TOTAL	2,900	N/A	1,061	N/A	2,050	N/A	1,400

*Dining facilities associated with place of residence.
†Facilities not yet constructed.

2. Estimate the maximum proportions of each of the user groups which will place a demand on dining facilities for each meal of the day [shown in Table 22, columns 3, 5, and 7].

3. Calculate the estimated maximum number of users for each meal of the day [shown in Table 22, columns 4, 6, and 8].

4. Compare total projected demand with total capacity for each meal of the day.

TABLE 23

COMPARISON OF PROJECTED DEMAND WITH TOTAL CAPACITY

(1) Meal	(2) Projected Demand	(3) Existing Capacity	(4) Difference (4)=(3)−(2)
Breakfast	1,061	1,628	+567
Lunch	2,050	2,028	−22
Dinner	1,400	1,128	−272

5. Determine those situations in which projected demand exceeds capacity and investigate alternative solutions.

As a result of this comparison, there is an indication that there is a significant deficiency of dining hall capacity for the evening meal. A review of the situation suggests that the only way to increase capacity of existing facilities would be to increase the number of turnovers in Harpur and Crosswell dining halls for the evening meal (say from 2 to 2.5 turnovers). If achievement of this higher turnover rate is deemed feasible, the result would be a capacity of 500 in Harpur for the evening meal and a capacity of 750 in Crosswell for the evening meal (a net increase in capacity of 250). This is almost sufficient to cover the deficiency in capacity and may represent a legitimate solution to the problem.

As a further check, capacity should be compared with demand on a facility-by-facility basis. At most institutions, certain user groups are restricted to certain dining facilities, and it is necessary to determine the effects of such restriction. For purposes of illustration, assume that

(a) The residents of the fraternity and sorority houses will take their meals in the houses.
(b) The residents of the existing institution-owned residence facilities (Harpur, Hale, Hanson, and Hamilton Residence Halls) will be served in Harpur House.
(c) All other groups will be served in Crosswell Hall and the Rathskeller.

The results of such an arrangement are shown in Table 24. It should be noted that a policy of assigning particular user groups to specific dining facilities reduces flexibility and creates a problem for Meal 2 in Crosswell Hall. There is a lack of capacity in Crosswell Hall and extra capacity in Harpur House.

TABLE 24

COMPARISON OF PROJECTED DEMAND WITH CALCULATED CAPACITY OF DINING FACILITIES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dining Facility and Associated User Groups	Meal 1		Meal 2		Meal 3	
	Projected Demand	Calculated Capacity	Projected Demand	Calculated Capacity	Projected Demand	Calculated Capacity
Sigma House Residents	44	44	44	44	44	44
Beta House Residents	36	36	36	36	36	36
Pi House Residents	48	48	48	48	48	48
Harpur House	N/A	600	N/A	600	N/A	500
Harpur Residents	135		182		182	
Hale Residents	98		133		133	
Hanson Residents	43		43		43	
Hamilton Residents	105		142		142	
	381		500		500	
Crosswell Hall and Rathskeller	N/A	900	N/A	1,300	N/A	750
Married Students	15		60		N/A	
Resident Single Male	97		131		131	
Resident Single Female	250		341		341	
Off-Campus Single Students	165		715		275	
Faculty, Staff, Guests, etc.	25		175		25	
	552		1,422		772	
TOTAL	1,061	1,628	2,050	2,028	1,400	1,378

COMMENTS ON THE PROCEDURE

Again, it should be noted that the capacity of dining facilities is also dependent on the capacity of service areas. As a result, the solution to the evening meal problem may be infeasible because of lack of service space capacity.

SECTION 3.2.3

General Method

PROJECTION OF REQUIREMENTS FOR DINING FACILITIES

DISCUSSION

DATA TO BE DETERMINED	►Additional dining Stations required
PROGRAM DATA REQUIRED	►Projected number of individuals in each of the defined groups of users
FACILITIES DATA REQUIRED	►Design seating capacity of the institution's dining facilities
UTILIZATION DATA REQUIRED	►Number of turnovers that can be achieved at each meal of the day
JUDGMENTS REQUIRED	►Estimated maximum proportion of the potential number of users of each group who will, in fact, eat each of the meals offered during the day.

PROCEDURE

1. Estimate the projected maximum number of diners at each meal of the day

   The projected number of diners at each meal is calculated by multiplying the number of individuals in each user group by the estimated proportion of each group who will eat each of the meals during the day. For purposes of the general method, only one or two user groups should be defined. Useful groupings would be "campus residents" and "all others," since the use patterns of these two groups could be expected to be very different. Other groupings may be even more useful in the light of particular circumstances at particular institutions. At some institutions, a single category may be appropriate.

2. Determine the serving capacity of the existing facilities for each meal.

   Capacity of existing facilities is determined by multiplying the number of dining Stations available for each meal by the corresponding estimated number of turnovers.

3. Compare the projected demand with existing capacity.

4. Determine the additional number of dining stations required.

   In cases where demand exceeds capacity, determine the additional number of Stations required by dividing the excess demand by the turnover rate applicable for that meal.

COMMENTS ON THE PROCEDURE

The general planning method for estimating the requirements for dining facilities is similar to the detailed method previously discussed. The only difference is that this shorter method is concerned with *total* demand and *total* capacity. The general method deals with fewer user groups and with total capacity of all facilities without regard for assignment of specific user groups to specific facilities.

This procedure has the benefit of simplicity, but does not include the detail necessary for good management. Even in those situations in which the outcomes of the procedure indicate sufficient capacity to meet projected demand, there may be some facilities which would be overutilized and others underutilized if current dining patterns were continued.

As a result, an outcome which indicates sufficient capacity may be masking serious discrepancies between demand and supply. Application of the detailed method is necessary to expose the true nature of any shortage of dining facilities. Where insufficient capacity is indicated, the alternatives are to add capacity by either construction of new space to make more intensive use of present space, or to reduce demand in some way.

SECTION 3.2.3

General Method

PROJECTION OF REQUIREMENTS FOR DINING FACILITIES

EXAMPLE

DATA TO BE DETERMINED ►Additional dining Stations required

PROCEDURE 1. Estimate the projected maximum number of diners at each meal of the day.

TABLE 25

PROJECTED NUMBER OF DINERS AT EACH MEAL*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
User Category	No. in Category	Breakfast		Lunch		Dinner	
		Per-cent	No. of Users (4)=(2)x(3)	Per-cent	No. of Users (6)=(2)x(5)	Per-cent	No. of Users (8)=(2)x(7)
Single On-Campus Residents	1,150	80	925	95	1,100	95	1,100
All Other	1,750	10	175	50	875	15	275
TOTAL	2,900	N/A	1,100	N/A	1,975	N/A	1,375

*Numbers have been rounded to the nearest 25.

2. Determine the serving capacity of the existing facilities for each meal.

TABLE 26

CAPACITY OF EXISTING DINING FACILITIES

(1)	(2)	(3)	(4)
Meal	Available No. of Stations	Turnovers	Capacity (4)=(2)x(3)
Breakfast	628	3	1,884
Lunch	678*	3	2,034
Dinner	628	2	1,256

*Variation due to use of Rathskeller for lunch only.

3. Compare the projected demand with the existing capacity.

TABLE 27

COMPARISON OF PROJECTED DEMAND WITH EXISTING CAPACITY

(1) Meal	(2) Projected Demand	(3) Existing Capacity	(4) Difference (4)=(3)−(2)
Breakfast	1,100	1,884	784
Lunch	1,975	2,034	59
Dinner	1,375	1,256	—119

4. Determine the additional dining Stations required.

Dinner is the only meal for which there is not sufficient existing capacity.

$$\text{Additional number of Stations required} = \frac{(\text{Number of diners})}{(\text{Turnovers})}$$

$$= \frac{(119)}{(2)}$$

$$\text{Additional Stations required} = 60$$

COMMENTS ON THE PROCEDURE

The reasonably small number of additional Stations required suggests that the solution to the problem may well be to increase the use of existing facilities rather than to construct new facilities.

SECTION 4.

STUDENT HEALTH FACILITIES

ROOM TYPES INCLUDED

Student health facilities and student health facilities service

DISCUSSION

The extent of the requirement for student health facilities is determined largely by the range of services which must be provided. This requirement, in turn, is determined by the range of services considered to be desirable (i.e., should mental health services be provided, should health care be provided to student's families, etc.?) and by the availability of delivery systems for such services in the surrounding community. The requirement at one institution, therefore, may be minimal while another institution of approximately the same size but in a different setting may require a full-scale hospital.

The importance of the role of the community in providing health care services creates a situation in which the planning of student health facilities is uniquely institutional. There are no widely applicable general methods for estimating future needs for this type of facility. Instead, planning for such facilities almost always reflects a reaction to specific needs at specific institutions.

The procedures presented on the following pages are designed to aid in evaluating current capacities and in estimating future requirements for only the "core" position of the student health facilities. They deal exclusively with number of beds required for inpatient services and with number of examining/consultation rooms required for outpatient services. The procedures do *not* deal with the vast array of support facilities such as dispensaries, clinical laboratories, administrative services, etc., since institutional individuality is more pronounced with regard to the service facilites than with the "core" facilities.

Similarly, this section does not deal with the question of staffing the student health facility. This, too, varies with local circumstances.

For information on detailed planning procedures for student health facilities and on staffing patterns for these facilities, the reader is referred to the *Manual of College Health Center Planning Procedures,* soon to be published by the American College Health Association.

SECTION 4.1.

EVALUATION OF THE CAPACITY OF EXISTING STUDENT HEALTH FACILITIES

DISCUSSION

DATA TO BE DETERMINED

- ►Current occupancy rates for existing student health facilities

FACILITIES DATA REQUIRED

- ►Number of infirmary beds currently available
- ►Number of examination/consultation rooms currently available

PROGRAM DATA REQUIRED

- ►Historical data on number of inpatient admissions per year
- ►Historical data on average stay of inpatients
- ►Historical data on number of outpatients treated daily

JUDGMENTS REQUIRED

- ►Average number of patients who can be treated in an examination/consultation room during the course of a day

PROCEDURE

Inpatient Student Health Facilities

1. Calculate the total patient bed-day capacity of the current student health care facilities.

   Total patient bed-day capacity is calculated by multiplying the total number of infirmary beds available at the institution by the number of operating days in the year that the facilities will be operated. While many institutions operate such facilities on a year around basis, the peak usage will normally occur in the September-June academic year. As a result it is suggested that the number of operating days in this period be used as a basis for this calculation.

2. Determine the current use of the student health facilities in terms of actual patient bed-days.

   This information, which is simply a summation of the number of days occupied for all available beds at the institution, is usually a matter of record in the office of the student health facilities director. Patient bed-days can also be calculated as the product of number of inpatient admissions and average number of days each admitted patient stays. The data correspond to the time period chosen in Step 1 above.

3. Calculate the occupancy rate.

   The occupancy rate is obtained by dividing the actual patient bed-days (determined in Step 2) by the total bed-day capacity of the facilities (calculated in Step 2).

4. Evaluate the occupancy rate.

   This step is subjective in nature and should be done in consultation with the student health facilities director.

Outpatient Student Health Care Facilities

1. Obtain a tabulation of the number of examination/consultation rooms which are available for outpatient services.

   This information should be available in the facilities inventory.

2. Determine the average number of patients who can be accommodated in each examination/consultation room each day.

   Admittedly, this determination is a function of the severity of the health problem involved. However, the student health facilities director should be able to indicate the average duration of an appointment. This figure, divided into the number of hours the outpatient services are available each day, results in an indication of the number of students who can be accommodated in one examination/consultation in a single day.

3. Calculate the daily capacity of the outpatient facilities.

   This capacity is calculated by multiplying the number of available examination/consultation rooms by the number of patients who can be accommodated in each examination/consultation room in a single day.

4. Determine the current use of the outpatient facilities.

   Current use is reflected in data on average number of outpatients seen daily. Such data are kept as a matter of record at most health care facilities.

5. Compare the current use with the calculated capacity of the outpatient facilities.

COMMENTS ON THE PROCEDURE

First, these procedures deal with averages. It is not feasible to build infirmaries designed to accommodate peak loads since this would result in a very low utilization rate a great deal of the time. In situations such as Asian flu epidemics, alternative methods of meeting the needs of the patients must be established.

Second, the procedure includes an implicit assumption that existing facilities are of a "type" appropriate to the institution (i.e., the institution has an outpatient clinic rather than a small-scale general hospital in situations in which this type of facility is appropriate).

Finally, the procedures associated with outpatient student health care facilities can also be used to determine the capacity of facilities used for delivery of mental health services.

SECTION 4.1.

EVALUATION OF THE CAPACITY OF EXISTING STUDENT HEALTH FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Current occupancy rates for existing student health facilities

PROCEDURE

Inpatient Student Health Facilities

1. Calculate the total patient bed-day capacity of the current student health care facilities.

$$\text{Total Patient Bed-day Capacity} = (\text{Total Beds Available}) \times (\text{Number of Operating Days in the year})$$

$$\text{Total Patient Bed-day Capacity} = (12) \times (300)$$

$$\text{Total Patient Bed-day Capacity} = 3{,}600 \text{ Patient Bed-days/Year}$$

2. Determine the current use of the student health facilities in terms of actual patient bed-days.

$$\text{Actual Patient Bed-days} = 2{,}060 \text{ Days/Year}$$

3. Calculate the occupancy rate.

$$\text{Occupancy Rate} = \frac{(\text{Actual Patient Bed-days})}{(\text{Total Patient Bed-day Capacity})}$$

$$= \frac{(2{,}060)}{(3{,}600)}$$

$$= 57\%$$

4. Evaluate the occupancy rate.

The occupancy rate must be evaluated in the light of institutional experience. Nevertheless, a value of 57 percent would generally indicate the availability of unused capacity.

Outpatient Student Health Care Facilities

1. Obtain a tabulation of the number of examination/consultation rooms which are available for outpatient services.

   Two examination/consultation rooms are devoted to outpatient services.

2. Determine the average number of patients who can be accommodated in each examination/consultation room each day.

   Records indicate that the average appointment duration is about 30 minutes and that the length of the normal operating day is 8 hours. Therefore, on the average, 16 outpatients can be served in each examination/consultation room each day.

3. Calculate the daily capacity of the outpatient facilities.

   $$\text{Total Daily Capacity} = (\text{Number of Examination Rooms}) \times (\text{Average Possible Number of Patients Daily})$$

   $$\text{Total Daily Capacity} = (2) \times (16)$$

   $$\text{Total Daily Capacity} = 32 \text{ patients}$$

4. Determine the current use of outpatient facilities.

   Records indicate that the average number of outpatients per day has been 28 for the past two years.

5. Compare the current average daily use with the total daily capacity of the outpatient facilities.

   The current use closely approximates the capacity of existing facilities. Steps should be initiated to provide an additional examination/consultation room. For example, a room currently devoted to inpatient care could be converted to use for outpatient care.

SECTION 4.2.

PROJECTION OF REQUIREMENTS FOR STUDENT HEALTH FACILITIES

DISCUSSION

DATA TO BE DETERMINED

►Number of infirmary beds and/or examination/consultation rooms required in the target year

PROGRAM DATA REQUIRED

►Projected number of students eligible for medical care in the target year

JUDGMENTS REQUIRED

►Inpatient admission rate
►Average duration of patient confinement
►Optimum percentage of beds occupied
►Average number of outpatient visits per year per individual
►Average number of persons who can be treated in an examination/consultation room in one day

PROCEDURE

Inpatient Student Health Facilities

1. Determine the number of persons who will be eligible for inpatient health care services.

   This determination requires identification of those groups of individuals eligible for health care services and the projection of the number of individuals in each group. These data are accumulated from the outputs of various steps in the planning process (e.g., from projections of number of students to be housed in campus facilities, from projections of number of faculty, staff, etc.).

2. Estimate the annual number of admissions for inpatient care.

   This factor is estimated by multiplying the number of individuals eligible for health care by the admission rate for inpatient care. Where admission data are available for different groups of individuals (staff, resident students, nonresident students, etc.), the number of admissions for each group can be calculated.

3. Calculate the number of patient bed-days per year.

   The number of patient bed-days is calculated by multiplying the number of inpatient admissions per year by the average duration of patient confinement.

4. Calculate the average daily census of inpatients.

   Divide the estimated number of patient bed-days per year by the number of days in the year. At most institutions the inpatient admissions will occur over the course of the September-June academic year with limited operation during the summer months. As a result the number of days per year will be less than 365.

5. Calculate the number of beds required.

   Divide the average number of patient bed-days per year by the desirable occupancy rate. In effect this step involves application of a safety factor.

Outpatient Student Health Care Facilities

1. Determine the number of persons who will be eligible for outpatient health care services.

   This step is similar to Step 1 of the procedures for inpatient student health facilities.

2. Estimate the annual number of outpatient visits.

   The total number of outpatient visits per year (or academic year) is calculated by multiplying the number of individuals eligible for outpatient care by the estimated number of visits per year for the individual. These projections can also be based on identifiable subgroups such as resident student, staff, etc.

3. Estimate the average number of outpatient visits per day.

   Divide the total projected number of outpatient visits by the number of days over which the load is generated.

4. Calculate the number of examination/consultation rooms required.

   The number of examination/consultation rooms required is calculated by dividing the projected number of outpatient visits per day by the number of persons that can be treated in an examination/consultation room in a single day.

COMMENTS ON THE PROCEDURE

As indicated in the discussion which is introductory to this section, a major portion of student health care facilities—the service space—is not covered by this procedure. The requirements for such space must be determined by the staff directly involved in the use of such facilities.

These procedures may be interpreted to be appropriate for requirements for the rapidly expanding mental health care programs. Requirements are determined on the same basis as requirements for outpatient medical care facilities.

SECTION 4.2.

PROJECTION OF REQUIREMENTS FOR STUDENT HEALTH FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Number of infirmary beds and/or examination/consultation rooms required in the target year

PROCEDURE

Inpatient Student Health Facilities

1. Determine the number of persons who will be eligible for inpatient health care services.

   All students will be eligible for inpatient health care services.

Single students living on campus	1,150
Single students living off campus	1,100
Married students	150
Total	2,400

2. Estimate the annual number of admissions for inpatient care.

   Historical records indicate that inpatient admission rates are approximately as follows:

Single students living on campus	0.5 admission/year
Single students living off campus	0.3 admission/year
Married students	0.1 admission/year

The number of admissions for inpatient care, therefore, is

1,150 x 0.5 = 575
1,100 x 0.3 = 330
150 x 0.1 = 15
920

3. Calculate the number of patient bed-days per year.

   Historical records indicate that the average duration of patient confinement is 3.4 days.

   Number of patient bed-days per year = 920 x 3.4 = 3,128

4. Calculate the average daily census of inpatients.

   The operating year covers 300 days, therefore:

$$\text{The average daily census} = \frac{3{,}128}{300} = 10.42 \text{ patients}$$

5. Calculate the number of beds required.

The desired bed occupancy rate has been established as 60 percent by this particular institution.

$$\text{Number of beds required} = \frac{\text{Average daily census}}{\text{Occupancy rate}}$$

$$= \frac{10.42}{.60} = 17.3 \text{ or } 18 \text{ beds}$$

Outpatient Student Health Care Facilities

1. Determine the number of persons who will be eligible for outpatient health care services.

All students and staff members will be eligible for outpatient care.

Single students living on campus	1,150
Single students living off campus	1,100
Married students	150
Staff members	350
Total	2,750

2. Estimate the annual number of outpatient visits.

Historical records indicate that the number of outpatient visits per year is approximately as follows:

Single students living on campus	5 visits/year
Single students living off campus	3 visits/year
Married students	2 visits/year
Staff	2 visits/year

Therefore, the total number of outpatient visits annually can be calculated as

$$\begin{array}{rcrcr}
1{,}150 & \times & 5 & = & 5{,}750 \\
1{,}110 & \times & 3 & = & 3{,}300 \\
150 & \times & 2 & = & 300 \\
350 & \times & 2 & = & 700 \\
\hline
 & & & & 10{,}050 \text{ visits annually}
\end{array}$$

3. Estimate the average number of outpatient visits per day.

$$\frac{10{,}050 \text{ visits}}{250 \text{ days}} = 40.2 \text{ visits per day}$$

4. Calculate the number of examination/consultation rooms required.

It is estimated that 16 individuals can be treated in examination/consultation rooms daily, therefore:

$$\text{Number of examination/consultation rooms required} = \frac{40.2}{16}$$

$$= 2.51 \text{ or } 3 \text{ rooms}$$

COMMENTS ON THE PROCEDURE

One of the critical elements in this example is the time dimension, i.e., the number of days over which the service load is distributed. In particular it should be noted that inpatient and outpatient services will often be distributed over a different number of days since the operation of outpatient clinics can be greatly reduced for one or more days per week where inpatient facilities cannot.

SECTION 5.

PROJECTION OF REQUIREMENTS FOR STUDENT SERVICE FACILITIES

DISCUSSION

ROOM TYPES INCLUDED Lounge, lounge service, recreation, recreation service, merchandising facilities, merchandising facilities service

DISCUSSION Most student service facilities are normally contained within a student union building or a student center. As a result of the common location of so many of these facilities, projecting the need for student service space is almost synonymous with projecting the need for a student union. It is not completely so, because it is not unusual to find lounge and commons space at other scattered locations throughout the campus.

The single facility operation of these types of space and the nature of the activities they house lead to a somewhat different planning process than is appropriate for most other types of space because the determination of utilization or current capacity in terms of the criteria applied to most other types of facilities is almost impossible. In fact, neither utilization nor capacity are particularly useful concepts for such facilities. They may be considered to be operating in excess of capacity if it is obvious that current facilities are much too limited in recreational offerings or are bulging from overuse.

As a result, the planning process for student service facilities is unlike that for most other types of space. In fact, the planning process for student service facilities perhaps may be described best as "planning in reverse." Generally, planning follows the logical sequence of estimating future loads, determining the facilities required to handle these loads, and, finally, calculating the funding requirements. However, for student service facilities, it is common to start with a specification of either the funds available or the maximum total allowable area for the facility. The procedure then becomes one of working backward toward a detailed description of what can be provided within the funding or the area constraints.

The reversal of the process has considerable merit in planning student service facilities. In all probability, unless the constraints were established initially, the planning process would be so open-ended that final resolution would require excessive amounts of time and energy.

The planning for a student center normally starts with the creation of a wish list. Many people will have suggestions and differing ideas about what should and/or should not be included. Since the exact nature of a student center on any given campus is determined more by philosophy, policy, and a perceived demand than by programmatic considerations, there is no simple way of screening the various suggestions. As a result *all* such suggestions tend to appear on the initial list. There is a space requirement associated with each item on this list, and, in fact, for many of these items there is a very rigid space requirement. The amount of space required for bowling alleys and ping-pong tables are relatively fixed.

Without imposition of some form of constraint, there is no motivation for establishing priorities among the items on the list nor to draw a line between what is to be included and what is not. To be most useful this constraint should be expressed in terms of Assignable Square Feet and total project cost.

Institutions in several states are guided by a constraint which has been determined on the basis of Assignable Square Feet allowed per full-time equivalent student. It is common for the allowances to be approximately eight to ten Assignable Square Feet per FTE student. Thus, for an institution of 10,000 FTE students, 80,000 to 100,000 Assignable Square Feet would be permitted. The institution is free to specify the activities to be housed within this space. Section 8 of this manual includes the specifics of some unit floor area criteria which apply to this particular type of space.

At many institutions, this constraint is expressed initially in terms of a funding limitation. Given a limitation in this form, however, it is relatively easy to convert to Assignable Square Feet by dividing the amount of funds by an estimated cost per Assignable Square Foot.

In summary, the planning of student service facilities is a matter of determining what the traffic will bear and planning the specifics accordingly.

Those few states that have published factors of Assignable Square Feet per FTE student for student service space recognize that not all such space is contained within a student union building. As a result a modest allowance (on the order of Assignable Square Feet per FTE student) is made for lounge and other student space at scattered locations on campus. In addition for nonresidential institutions, such as community colleges, an additional Assignable Square Feet per FTE student may be allowed for locker space. This allowance is justified on the basis that the commuting student does not have a dormitory room available for use during the day, and it is unreasonable to ask him to carry around all the books and supplies needed for an entire day's classes.

DATA TO BE DETERMINED

►Estimated Assignable Square Feet of student service facilities

PROGRAM DATA REQUIRED

►Projected number of FTE students

JUDGMENTS REQUIRED

►Assignable Square Feet of student service space per FTE student

PROCEDURE

1. Develop, select, or adopt facilities planning criteria for student service spaces which reflect the wishes of the institution.
2. Calculate the estimated student service facilities requirements.

   This calculation requires multiplying the number of FTE students by the Assignable Square Feet of student service space allowed per student.

COMMENTS ON THE PROCEDURE

The nature of the space and the nature of the process are such that any attempt to describe the planning procedure is doomed to failure. The result of the calculation provides nothing more than a guideline as to the sufficiency of existing facilities or to the order of magnitude of need for new facilities.

SECTION 5.

PROJECTION OF REQUIREMENTS FOR STUDENT SERVICE FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Estimated Assignable Square Feet of student service facilities

PROCEDURE

1. Develop, select, or adopt facilities planning criteria for student service spaces which reflect the wishes of the institution.

   (a) Student Union — 9.5 ASF/FTE Student
   (b) Lounge and Commons — 1.5 ASF/FTE Student

2. Calculate the estimated student service facilities requirements.

TABLE 28

ESTIMATED STUDENT SERVICE FACILITIES REQUIREMENTS

(1)	(2)	(3)	(4)
Facility	Students (FTE)	Factor (ASF/FTE)	Assignable Square Feet (ASF) (4) = (2) × (3)
Student Union Facilities	2,400	9.5	22,800
Commons and Lounge Facilities	2,400	1.5	3,600
TOTAL	N/A	N/A	26,400 ASF

SECTION 6.

PROJECTION OF REQUIREMENTS FOR PHYSICAL PLANT FACILITIES

DISCUSSION

ROOM TYPES INCLUDED

Shop facilities, shop facilities service, storage facilities, storage facilities service, vehicle storage, vehicle storage service

DISCUSSION

These supporting facilities are designed primarily to house the operational and maintenance requirements of an institution's plant. Their existence is dependent upon many factors, among which are operational style, size, and location of the institution. Economies of scale allow larger institutions to retain complete automotive servicing facilities for their institutional fleet of cars; a full-time staff of carpenters, plumbers and electricians to take care of repair and minor remodeling tasks; and large, skilled, machine shop staffs. In contrast is the small institution which cannot afford nor allow itself the expense of such a vast support staff. Such factors all tend to play a role in determining the amount of space necessary to take care of the custodial, maintenance and repair, and security needs of an institution.

To describe detailed projection techniques for these types of supporting space would be misleading because of the unique factors and circumstances which come into play at each institution. Only a very general planning method will be suggested here to indicate to the planner the overall needs for these types of facilities. Circumstances at each institution will determine the specific needs.

DATA TO BE DETERMINED

►Assignable Square Feet of physical plant facilities

FACILITIES DATA REQUIRED

►Assignable Square Feet of all types of space to be maintained by the institution

JUDGMENTS REQUIRED

►Ratio of Assignable Square Feet of physical space to Assignable Square Feet of space to be maintained

PROCEDURE

1. Summarize the projections of Assignable Square Feet required for all types of space to be maintained by the institution.

   At many institutions, separate staffs are employed for the purposes of maintaining dormitory, dining, and other auxiliary enterprise facilities. At other institutions, independent contractors provide custodial and maintenance services for some or all space. The Assignable Square Feet not maintained by the institution's physical plant staff should not be included in the base from which physical plant facilities are calculated.

2. Establish a ratio of Assignable Square Feet of physical plant space to Assignable Square Feet of space to be maintained.

   This percentage, multiplied by the total Assignable Square Feet to be maintained by the institution, will yield the amount of space necessary to support these maintenance and service activities. For planning purposes physical plant space is usually calculated as a stated percentage of the space to be maintained. It is suggested that office facilities for the physical plant staff be projected on the basis of the procedure presented in Manual Three.

3. Calculate the Assignable Square Feet of maintenance and service areas.

   This figure is the mathematical product of the percentage determined in Step 2 and the Assignable Square Feet determined in Step 1.

COMMENTS ON THE PROCEDURE

The ratio of Assignable Square Feet of physical plant space to Assignable Square Feet to be maintained normally varies in the range of 2-4 percent. Size of institution and the nature of the services provided by the physical plant staff are the determinants of this factor for a particular institution.

SECTION 6.

PROJECTION OF REQUIREMENTS FOR PHYSICAL PLANT FACILITIES

EXAMPLE

DATA TO BE DETERMINED

►Assignable Square Feet of physical plant facilities

PROCEDURE

1. Summarize the projected Assignable Square Feet required for all types of space to be maintained by the institution.

   Total Assignable Square Feet to be maintained = 432,060 ASF

2. Establish a ratio of Assignable Square Feet of physical plant space to Assignable Square Feet of space to be maintained.

   Since offices have been included in another technique and the primary needs are for warehouse and shop space, 3.5 percent seems a sufficient allowance.

3. Calculate the Assignable Square Feet of maintenance and service areas.

$$\begin{aligned}\text{Assignable Square Feet} &= (\text{Percentage}) \times (\text{Total ASF})\\ &= (3.5\%) \times (432{,}060)\\ &= 15{,}120 \text{ Assignable Square Feet}\end{aligned}$$

SECTION 7.

PROJECTION OF REQUIREMENTS FOR OTHER SPECIAL USE AND GENERAL USE FACILITIES

ROOM TYPES INCLUDED Assembly facilities, armory, clinic, demonstration facilities, field service facilities

DISCUSSION Detailed analyses of program data are not usually required in order to establish the need for the type of facilities discussed in this section. On most campuses these are unique, one-of-a-kind facilities. Where they exist, there is little probability that they will be expanded or duplicated. At institutions where such facilities do not exist but are planned, the planning activities are oriented heavily toward the design of the particular facility which will satisfy a particular combination of needs existing, perhaps, at that institution alone.

Facilities planning, in the generalized sense, can be accomplished only when some indicator of projected load (such as number of students, or faculty, or number of student credit hours) is available from which the facilities requirements can be derived. In the case of these particular Special Use and General Use Facilities either the indicators of load are varied, overlap, or are otherwise unclear or there are no generally acceptable procedures available by which facilities requirements can be derived from the projected load data.

Assembly Facilities

Assembly facilities exemplify a space need for which there is no single, controlling indicator of load. Theaters, auditoriums, chapels, and other assembly facilities often must satisfy a wide variety of institutional and community needs. They shelter such diverse activities as assemblies and colloquia, theatrical and dramatic productions, musical presentations, student organizational meetings, commencement exercises, religious services, lectures and other formally scheduled instructional activities, public meetings and productions, and even organ and piano practice.

Although it might be possible to establish a separate load factor for every preconceived use of such a facility, it is highly unlikely that these load factors could be synthesized to provide a workable basis for projecting these kinds of facilities requirements. A facility designed to house a combination of activities probably will differ in at least one respect from a facility designed to house any single activity. For example, the resulting facility may be larger than desirable to be a theater, too small to serve all the requirements for an auditorium, and have more stage and support space than is required for most auditorium uses and less than desired for a theater. Although such a facility may not serve any one of the activities it houses *optimally,* with some architectural ingenuity it can serve most of them adequately.

Even if load factors could be developed for every preconceived use of a facility of this type, they would not provide a sufficient planning base. One of the characteristics of almost all General Use Facilities is that, once constructed, they are used for many activities which had not been considered previously. They do, in fact, become General Use Facilities. The uses are so varied and so numerous that it is impractical, if not impossible, to develop a space factor or formula which can indicate to the user how much of this particular type of space he needs. Such space *must* be tailored to the needs of each institution.

Armory, Clinic, Demonstration, and Field Service Facilities

Armory, clinic, demonstration, and field service facilities, on the other hand, exemplify the situation in which load factors in terms of student users can be determined but in which there are no generally acceptable procedures or factors available from which facilities needs can be calculated. In most respects all such facilities can be treated as "mutant" forms of class laboratories. As a result, the projected number of users for these types of facilities is either the projected number of registrations in specific courses or in all courses offered by certain departments. Normal procedures for projecting instructional loads will yield the projected number of enrollments in military science courses and in courses in agriculture, home economics, education, speech therapy, etc., which usually place a demand upon these facilities. However, once these load factors are developed, it is extremely difficult to convert them into space requirements on any basis other than "custom tailoring."

Demonstration schools illustrate one of the problems in planning for these types of facilities. In these schools the amount of space required is determined not only by the number of student teachers to be trained, but also by the number of elementary and secondary students to be enrolled. The whole realm of problems associated with constructing a facility for elementary or secondary education comes into play. Similarly, the amount of space devoted to teaching clinics is a function of the number of clients as well as the number of staff and student trainees.

The requirement for armory facilities depends in part on the extent to which certain components of such a facility can be shared. If an indoor drill area is required, can it be provided in a field house and thus shared with an athletic program, or must it be included in the armory? Is a rifle range available nearby or must one be constructed? In other words, an armory on one campus may be composed of *all* facilities required by military science programs. On another campus, armory facilities may contain only weapons rooms, supply rooms, and some office and classroom space (which should be planned in accordance with the procedures indicated in Manuals Two and Three).

Field service facilities also represent a unique planning problem. The function of such facilities usually is to shelter animals or to store and protect farm equipment, products, and supplies. These facilities are so varied in nature that projection of future needs is almost impossible.

A final characteristic of all of these types of spaces is the extent to which actual planning of such facilities is dependent upon prior identification of funding sources. For all types of facilities for which there are no well-established relationships between loads and facilities requirements, planning often proceeds on the basis of what the market will bear. Multiplicity of use in such facilities as auditoria and field houses is increased or diminished by the amount of financial resources available. Similarly, actual planning of facilities such as armories and field service facilities, which have very restricted uses, does not begin until the source and amount of funding is identified.

SECTION 8.

UNIT FLOOR AREA CRITERIA

ROOM TYPES INCLUDED

Athletic/physical education facilities, athletic facilities spectator seating, athletic/physical education facilities service

Food facilities, food facilities service, food service in residence halls

Lounge facilities, lounge facilities service

Recreation facilities, recreation facilities service

Residence for single persons, dormitory, one-family dwelling, multiple-family dwelling

DESIGN CRITERIA

Design criteria are tabulated by

- ►Type of athletic activity (for athletic/physical education facilities)
- ►Area per dining Station (for food facilities)
- ►Activities (for lounge and recreation facilities)
- ►Type of occupancy (for residence facilities)

DISCUSSION

Table 29 displays a tabulation of athletic/physical education space design criteria. Of all design criteria, perhaps these are easiest to compile and list since the space required for competitive activity usually is determined by the rules of the game. Of course, circulation and buffer space must be considered. The table includes allowances for these, but there is room for variation in the factors listed.

TABLE 29

ATHLETIC/PHYSICAL EDUCATION SPACE UNIT FLOOR AREA CRITERIA*

	(1)	(2)
	Athletic Activities Station or Component*	Assignable Square Feet
1.	Basketball courts:	
2.	Practice court	4370
3.	Competition court	6240
4.	Combination of 2 practice courts and 1 competition court	8735
5.	Baseball diamond (infield for field house)	16900
6.	Football cage (field house)	19260
7.	Indoor track: ¼ mile, 6 lanes	33000
8.	Handball: 4-wall court	1060
9.	Handball: 1-wall court	680
10.	Squash: doubles court	1125
11.	Squash: singles court	595
12.	Shuffleboard	625
13.	Volleyball (per court)	3025
14.	Wrestling (per mat)	1155
15.	Boxing:	
16.	Ring (1)	900
17.	Punching bag (per bag)	15
18.	Punching bag, heavy (per bag)	35
19.	Pool (olympic standards — 6 lanes)	7130
20.	Exercise room (per person)	50
21.	Rifle range (per point or firing position)	400
22.	Pistol range (per point or firing position)	320
23.	Fencing (per strip)	325
24.	Spectator seating, foldable (per seat)	2.5
25.	Lockers (per locker):	
26.	Varsity rooms	10
27.	General locker room	6.75
28.	Tote basket	.50
29.	Showers (per head, gang showers)	16
30.	Shower-dressing stall for women (per unit)	24
31.	Ticket booth	25
32.	First aid, training, physical therapy room	750

*With the exception of self-contained facilities (e.g., handball and squash courts), the criteria all include allowances for buffer zones or circulation space around actual playing or competition area. Clearly, there is room for variation from these figures since (a) competition areas need not be regulation size, and (b) two or more units may be combined, with resulting savings in circulation space needs.

Source: Association of State Institutions of Higher Education of Colorado, *Guideline Procedures and Criteria for Campus Development and Capital Outlay Planning,* April, 1964.

Unit floor area criteria for the other types of facilities listed are not as common as they could be. There are, however, many planning standards (see Manual Six) for these same facilities. The unit floor area criteria listed in Table 30 are not intended to be comprehensive, primarily because of the latitude needed to account for individual institutional prerogatives in such cases. Table 30 lists the criteria suggested in these facilities.

TABLE 30

GENERAL USE FACILITIES UNIT FLOOR AREA CRITERIA

(1) Type of Facility	(2) Item	(3) Assignable Square Feet
1. Food Facilities	1. Dining Station — Family Size	12.5
	2. Dining Station — Cafeteria	11.0
	3. Dining Station — Snack Bar	10.0
2. Lounge Facilities	1. Station — Commons Room	20
3. Recreation Facilities	1. Lockers	6.75
	2. Meeting Room	20 ASF/Station
	3. Barber Shop	100 ASF/Chair
	4. Billiards	320 ASF/Table
	5. Bowling Alley	575 ASF/Lane
	6. Kitchenette	20
	7. Table Tennis	345 ASF/Table
4. Residential Facilities	1. Single Occupancy*	110 - 130
	2. Double Occupancy*	190 - 230
	3. Married — One Bedroom	570 - 650
	4. Married — Two Bedroom	620 - 750

*Toilets, washrooms, showers, and recreational space are not included.

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

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MANUAL SIX

PROGRAM PLANNING AND ANALYSIS: THE BASIS FOR INSTITUTIONAL AND SYSTEMWIDE FACILITIES PLANNING

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Section 1.

INTRODUCTION

Manual Six deals with two distinct topics, the program planning and analysis techniques which provide the foundation for the facilities planning procedures at the institutional level and a system of general planning criteria designed for use at systemwide or statewide levels.

As indicated in the description of the comprehensive planning process in Manual One, the facilities planning process is an outgrowth of academic program planning and should not be begun until some results of the institution's academic program planning are available. Logically, the material concerning academic program planning should precede that dealing with procedures for facilities planning. However, because the manuals are intended to deal *primarily* with facilities planning *per se* and not with the broader aspects of institutional planning the order of presentation has been revised. This results as a matter of emphasis of these manuals, *not* as an indication of the relative importance of facilities planning vis-à-vis academic program planning.

The material presented in Manuals Two through Five and the material concerning program planning and analysis are specifically designed for use at the institutional level. As a result, those manuals do not satisfy the need of those agencies responsible for evaluating the results of institution-level planning efforts. In response to these needs a system of general planning criteria designed for application at the systemwide and statewide levels is proposed in Section 3. of Manual Six.

These two topics have been combined in a single manual for two reasons. First, the material concerning these two topics probably is more subject to change than that dealing with facilities planning at the institutional level. Many of the activities of the Planning and Management Systems program at WICHE will result in improved techniques for academic program planning. Similarly, changes and refinements to the proposed system of general planning criteria must be expected as a result of initial attempts to apply these procedures. By including those materials most subject to change within the same manual, the mechanical aspects of revision are simplified.

Second, this particular arrangement serves to focus attention on the differences between the planning processes appropriate at the institutional level and those appropriate at the statewide level. In particular, the varied levels of detail required are emphasized.

At the same time, this comparison should make obvious the common elements between institutional and statewide planning. Careful study of the two major topics of this manual should lead to an understanding of how the general planning criteria can be effectively applied to the evaluation of the results obtained from the detailed institutional planning procedures.

Section 2.

PROGRAM PLANNING AND ANALYSIS

The process of projecting any future resource requirement of an institution of higher education begins with some notion of what the institution is and of what it can and should be in the future. The policy makers of an existing institution build from the base of *what is* toward conceptions of potential future development. The planners of a new institution must build toward what they visualize that institution as *becoming*.

Planning for the future development of an institution must be organized around images of its potential juxtaposed against existing institutional patterns. For an existing institution this pattern is the institution's own history. In contrast, a new institution is planned on the basis of some chosen model, either an existing institution or some idealized concept of an institution. In either case projecting future resource needs for an institution of higher education requires an ability to analyze the current state, whether of an existing institution or of a model chosen for the purpose, and to recommend alterations to this state in response to future objectives, constraints, and opportunities.

The processes of planning for the future and of analyzing the present go hand in hand. Without the capacity to analyze some existing model, there is no foundation upon which to base projections of the future. Similarly, without the intent to use the results of analysis in the course of planning for the future, there is little justification for expending the time and energy required by the analytic activities.

Since the analysis of what does exist is so thoroughly intertwined with the planning of what will exist in the future, there is every reason to develop an analytic capability in a manner that meets directly the requirements of the planning activities. Such analyses are, in turn, dependent upon the availability of certain kinds of data. Without the required information on students, courses, staff, and teaching loads, facilities, and the like, these basic analyses cannot be accomplished.

Sections 2.1., 2.2., and 2.3. of this manual are devoted to presentation of

- ►Program planning techniques which provide the information basic to facilities planning
- ►Analytic methods which support these program planning techniques
- ►A summary of the data required by these analyses

Because the relationships between program planning, program analysis, and the data requirements are so intertwined, this separation is somewhat artificial. Such a separation, however, simplifies the explanation of the material and has been maintained solely for that reason. The order of presentation is intended to indicate that it is the planning process which prescribes the analyses required and that this, in turn, serves to determine the data requirements. Operationally, these steps are reversed: data must be available before analyses can be performed and analytic results are required prior to completion of the planning activities.

Section 2.1.

PROGRAM PLANNING

INTRODUCTION

Program planning for institutions of higher education is a continuing series of interrelated processes that must be approached separately and molded into the total plan as a final step.

The facilities planning process is such that only selected elements of the program planning process are required to support it. The elements of the program planning process which are particularly necessary for facilities planning are

- ►Projection of instructional loads
- ►Projection of faculty and support staff in academic departments
- ►Projection of support employees in nonacademic departments
- ►Projection of number of students and others to be served in auxiliary enterprise facilities (residential, dining, student health, recreation, etc.)

The program planning techniques relevant to each of these four elements are described in the following pages.

Section 2.1.1

Program Planning

PROJECTION OF INSTRUCTIONAL LOADS

The distribution of instructional loads among the various academic departments of an institution is the single most important determinant of the allocation of resources at most institutions. As a result, the techniques for estimating each department's instructional load, given a projection of the institution's enrollments, are extremely critical elements of the planning process.

In the following sections two methods for projecting instructional loads are described. First, a detailed method based on projected course enrollment is presented. Second, a more generalized method for projecting instructional loads is explained. The advantages and disadvantages of both are included as a part of the description of these techniques.

Section 2.1.1

Program Planning

DETAILED PROJECTION OF INSTRUCTIONAL LOADS

DISCUSSION

The detailed method of projecting instructional loads is based on a course-by-course projection of enrollments. Without question there are many difficulties associated with attempting to develop and use projections of instructional loads which are so detailed. The first problem is one of magnitude; a great deal of data is needed to develop a projection at this level of detail. The second major problem is one of instability; at a complex or growing institution, rapidly changing conditions make projections of enrollments in particular courses all but impossible. At this level of detail, the probabilities of error are very high.

Nevertheless, an explanation of the detailed methods for projecting instructional loads has utility. At many smaller, stable institutions the procedures are applicable. At such institutions projections of course enrollments may well be made with reasonable accuracy. If so, use of this methodology lends greater support to the facilities planning process. At larger institutions a great deal of planning is done at the level of the department or other lower organizational unit. The detailed procedures are as applicable for use by departments or schools within large institutions as for small institutions.

For those institutions for which projection of instructional loads at the course-by-course level of detail is not appropriate this discussion will serve to describe the underlying process. Even when more highly aggregated projection factors are used these factors must accurately reflect the underlying course-by-course activity they are intended to represent. Only by understanding this process is it possible to develop simplifications and aggregations. Given an understanding of these detailed procedures, the decisions required prior to use of the generalized procedures for projecting instructional loads (see Section 2.1.2) can be made with the necessary insight.

DATA TO BE DETERMINED

- ►Projected classroom Weekly Room Hours (WRH) by Section Size*
- ►Projected classroom Weekly Student Hours (WSH) by Section Size
- ►Projected class laboratory Weekly Room Hours (WRH) by Section Size for each type of class laboratory
- ►Projected class laboratory Weekly Student Hours (WSH) by Section Size for each type of class laboratory
- ►Student Credit Hours (SCH) for each department and course level
- ►Weekly Student Hours (WSH) for each department and course level
- ►Weekly Room Hours (WRH) for each department and course level

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*Although not an essential element of the procedure, it is useful to maintain these data by department in addition to Section Size.

PROCEDURE

1. Obtain projections of numbers of students categorized by majors and student levels.

The program planning process that precedes the determination of academic facilities requirements normally begins with a projection of the future composition of the student body. Although other approaches are possible,* there appear to be no substantial reasons for deviating from what has become an almost standardized procedure.

As a basis for planning academic facilities, the student characteristics that are integral to the projections are student major and student level. Form P-1 indicates one way in which the projected student data can be arrayed.

Enrollment projections initially are expressed in terms of head-count students. Such projections do not reflect differences in loads taken by different students; all students appear to generate equal loads. Projections expressed in terms of head-count students may be used without modification if

(a) the student body is quite homogeneous and all students generally carry approximately equal loads; or
(b) the student body is heterogeneous with respect to load carried, but the proportions of the various subpopulations are constant over time.

At some institutions, however, there are two or more identifiable subpopulations of students which generate significantly different loads. Moreover the proportion of students in each subpopulation may change over time. An example would be the community college with a full-time resident student body which also serves a large group of part-time students who are granted "release time" from work by their employers. The proportion of students in each subpopulation may vary significantly over time. In such cases it is suggested that enrollment projections be made independently for each subpopulation and that a separate Form P-1 be completed for each group.

It should be noted that this recommendation refers specifically to the situation in which the different subpopulations of students are enrolled in the same programs. In addition, projections of students enrolled in different programs (e.g., day students vs. evening students) should be made and recorded separately. This is a standard practice at most institutions in which this situation occurs.

There are many applications for which Full-Time Equivalent Student data are required. In order to obtain these data the projected head-count enrollment must be converted to FTE Students. Several conventional conversion techniques are in widespread use. One method of calculating FTE Students is based on the number of Student Credit Hours considered to be a full-time load. Another method requires calculating the full-time equivalence of those students considered to be part-time and adding this result to the number of students considered to be full-time. The method to be used at any particular institution is determined by its situation and the requirements of the concerned governing agencies.

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*For example, it is possible to begin the planning process by organizing a faculty with a particular set of special capabilities, designing a curriculum with academic requirements that coincide with this faculty's capabilities, and then attracting a student population of the size and type appropriate for the academic program provided by the planned faculty. Although feasible, this approach is rarely used.

FORM P-1

PROJECTION OF HEAD-COUNT STUDENTS BY MAJORS AND STUDENT LEVELS FOR FALL 19.......

(1)	(2)	(3)	(4)	(5)	(6)
	Student Level*				
Majors†	Lower Division Undergraduate	Upper Division Undergraduate	Grad. 1	Grad. 2	Totals
Undeclared	600	N/A	N/A	N/A	600
Major #1	80	200	50	30	360
Major #2					
.					
.					
.					
Major #N	10	32	N/A	N/A	42
Total					

*Some institutions may wish to use a different (or finer) categorization (e.g., Freshman, Sophomore, Junior, Senior for a four-year institution). The levels indicated on the form represent the minimum recommended for an institution with a doctoral program. The definition of the categories listed on this form are included in Section 2.3. of Manual Six. For other possibilities refer to *Data Elements Dictionary-Students*.

†The listing of majors or any aggregations thereof must be provided by each institution. It may be useful for the institution to aggregate majors in accordance with the *Taxonomy of Instructional Programs in Higher Education.*

Various procedures for projecting enrollments in accordance with these requirements have been developed and are well documented.* As a result, no discussion of these procedures is included in these manuals.

2. Calculate course enrollments to be generated or induced by the projected student population.

   The estimation of instructional loads generated by a projected student population can be accomplished in a variety of ways. The primary difference between these techniques is the level of detail involved. The level of detail ranges from projecting enrollments in every course to estimating total Student Credit Hours generated by the entire student population.

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*See, for example, Office of Program Planning and Fiscal Management, State of Washington, "Higher Education Enrollment Projection Model," 1970, forthcoming; Wayne Smith, "A Student Flow Model," mimeographed (Los Angeles, California: Office of Advanced Planning, University of California at Los Angeles, 1970); the Student Flow Model project of WICHE-PMS is also dealing with this problem.

The controlling variables and the relationships between these levels of detail can be illustrated best through an explanation of the most detailed of these procedures; that is, the projection of course enrollments. Generalization to the less detailed levels is accomplished primarily through a series of aggregations which are described in the following section.

The central element in the calculation of projected instructional loads is the *Induced Course-Load Matrix* (ICLM). When associated with projections of course enrollments, the Induced Course-Load Matrix (hereafter referred to as the ICLM) is a table in which the entries are the proportions (decimal fractions) of the total number of students of each student level and major expected to enroll in each course in a specified future term. The development of an ICLM is discussed in detail in Section 3. of this manual. The raw data required for the development of the ICLM are contained in Form A-1, and an ICLM devised from these data is illustrated in Form A-2. The detailed ICLM presented as Form P-2 has the same format as Form A-2.

The calculation of projected course enrollments is accomplished by multiplying each of the entries in the ICLM by the projected number of students of each major and student level and then summing the products for each course. The result of this operation is the projected number of students enrolled in each course for the specified future term. The results are illustrated by Form P-3.

Note: One of the desirable outcomes of this procedure is a projection of the number of graduate students of each student level expected to be engaged in research efforts in each department. Many systems handle this projection by establishing a course number for their work and requiring those individuals who are engaged in thesis research to enroll in this "course." The projected number of students engaged in research is then obtained as a natural consequence of the process by which expected course enrollments are estimated.

FORM P-2

DETAILED INDUCED COURSE-LOAD MATRIX* PROJECTED FOR FALL 19........ TERM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)
		Student Characteristics†												
		Major A				Major B					Major N			
		Lower Div.	Upper Div.	Grad. 1	Grad. 2	Lower Div.	Upper Div.	Grad. 1	Grad. 2	....	Lower Div.	Upper Div.	Grad. 1	Grad. 2
	Projected Number of Students in Each Category	600	0	0	0	80	200	50	30	....	10	32	0	0
Course Designation	01.11	0.90	0	0	0	0.90	0.10‡	0	0	....	1.00	0.10	0	0
	01.33	0‡	0	0	0	0	0.67	0.10	0	....	0	0.25	0	0
	01.54	0	0	0	0	0	0.10	1.00	0.2	....	0	0	0	0
	etc.													

*Entries are proportions of students of each major and level expected to enroll in each course.

†The student characteristics categories of major and level should be identical with those indicated on Form P-1.

‡Differences in entries between Form P-2 and Form A-2 represent adjustments to compensate for expected changes in curricula and enrollment patterns.

FORM P-3

PROJECTED COURSE ENROLLMENTS BY MAJOR AND STUDENT LEVEL*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)
		Student Characteristics													
		Major A				Major B					Major N				
		Lower Div.	Upper Div.	Grad. 1	Grad. 2	Lower Div.	Upper Div.	Grad. 1	Grad. 2	....	Lower Div.	Upper Div.	Grad. 1	Grad. 2	
	Projected Number of Students in Each Category	600	0	0	0	80	200	50	30	....	10	32	0	0	Total Number of Enrollments in Course
Course Designation	01.11	540	0	0	0	72	20	0	0	....	10	3	0	0	940
	01.33	0	0	0	0	0	134	5	0	....	0	8	0	0	248
	01.54	0	0	0	0	0	20	50	6	....	0	0	0	0	76
	etc.														

*Each entry in this form is the number of students of each major and level enrolled in each course.

For those institutions which have two or more definable special subpopulations, separate ICLMs and calculations of course enrollments are recommended. After the course enrollments generated by each group have been calculated, the total number of enrollments in each course can be obtained by summing across the subpopulations. The result is total enrollments in each course.

3. Collect the required basic information about each course.
In order to calculate the faculty and facility requirements associated with each course certain basic characteristics of each course must be known. The information which must be available for each course is

- ►Course identifier
- ►Department offering the course
- ►Classroom Weekly Contact Hours (WCH)*
- ►Maximum size of classroom sections
- ►Laboratory Weekly Contact Hours (WCH)*
- ►Maximum size of laboratory sections
- ►Course Credit Hours (CCH)†
- ►Course Credit Hours (CCH) attributable to "other" instruction (i.e., independent study, thesis, etc.)‡

Form P-4 represents one format for displaying this particular information.

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*Weekly Contact Hours is defined as the number of hours per week that a (classroom or laboratory) Section is scheduled to meet.

†Course Credit Hours is defined as the credit hour value attached to the course.

‡The Course Credit Hours attributable to "other" instruction are a subset of the total Course Credit Hour allowance for the course. It is suggested that the separate credit value be established *only* for "other" instruction and that no attempt be made to extend the practice to classroom and class laboratory instruction.

FORM P-4

COURSE CHARACTERISTICS INFORMATION

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Classroom		Class Laboratory			
Course Identifier*	Dept.	Weekly Contact Hours	Max. SS	Weekly Contact Hours	Max. SS	Total CCH	"Other" CCH
01.11†	Physics	1	300	3	60	4	0
"		2	25	....	....	....	....
01.33	"	3	40	0	0	3	0
01.54	"	0	0	0	0	3	3
etc.							

*Must describe level of the course.

†Course 01.11 has both lecture and recitation sections (i.e., two kinds of classroom meetings), therefore, two entries are required in columns 3 and 4.

4. Calculate the distribution of Weekly Student Hours (WSH) and Weekly Room Hours (WRH) by Section Size (SS) and type of instruction.

   In order to determine the requirements for classrooms and class laboratories, it is necessary to convert the projections of course enrollments to Weekly Room Hour requirements for classrooms of various sizes and for class laboratories of different types and sizes. The process for calculating the distributions of WSH and WRH required by the classroom and class laboratory planning procedures presented in Manual Two is described below.

   (a) Determine for each course the required number of classroom and class laboratory Sections and the average size of each kind of Section.

   The minimum number of Sections required for each type of instruction is determined by dividing the projected number of course enrollments by maximum Section Size for the corresponding type of instruction and rounding the quotient upward to the next largest whole number. The Average Section Size (AvSS) for each type of instruction is calculated by dividing the projected number of course enrollments by the number of Sections. As an example, consider course number 01.11:

Projected number of course enrollments	940
Maximum SS for lecture Sections	300
Maximum SS for recitation Sections	25
Maximum SS for laboratory Sections	60

940/25 = $37\frac{3}{5}$ or 38 recitation Sections
940/300 = $3\frac{2}{15}$ or 4 lecture Sections
940/60 = $15\frac{2}{3}$ or 16 laboratory Sections

AvSS = 940/4 = 235 for lecture Sections
AvSS = 940/38 = 25 for recitation Sections
AvSS = 940/16 = 59 for laboratory Sections

(b) Determine for each course the Weekly Room Hour requirements for Sections of each size and type of instruction.

This is accomplished by multiplying the number of Sections by the Weekly Contact Hours (WCH) for each Section. Again use course 01.11 as an example.

In the previous step the calculations resulted in a requirement for

4 lecture Sections with an AvSS of 235
38 recitation Sections with an AvSS of 25
16 laboratory Sections with an AvSS of 59

The information in Form P-4 indicates that lecture Sections meet one hour per week, recitation Sections two hours per week, and laboratory Sections three hours per week.

Combining these figures yields

4 Sections × 1 WCH = 4 WRH required for lecture Sections of 235
38 Sections × 2 WCH = 76 WRH required for recitation Sections of 25
16 Sections × 3 WCH = 48 WRH required for laboratory Sections of 59

(c) Calculate Weekly Student Hours by Section Size and type of instruction.

This is accomplished by multiplying the number of WRH by the corresponding AvSS. For example:

4 × 235 = 940 WSH in Sections of average size 235

(d) Summarize the distributions of Weekly Student Hours and Weekly Room Hours by Section Sizes.

The data for *all* instructional activities conducted in classrooms should be entered in the same form. Form C-1 (similar to Table 5 in Manual Two and repeated on page 13 of this manual for reference) is used for summarizing these data. The information on Form C-1 is basic to the facilities planning procedures outlined in Manual Two. The data for class laboratories should be aggregated by Laboratory Type (i.e., according to groupings of courses which can share laboratory facilities). If, for example, an analytical chemistry course requires a separate laboratory, the Weekly Room Hour (WRH) and Weekly Student Hour (WSH) data for this course would not be grouped with data from other chemistry courses. Form CL-1 is used for summarizing these data and is similar to Table 24 in Manual Two.

FORM C-1

PROJECTED WEEKLY ROOM HOURS (WRH) AND WEEKLY STUDENT HOURS (WSH) BY SECTION SIZE (SS) FOR CLASSROOMS

(1)	(2)	(3)
Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
235	4	940
etc.		
25	50	1,250
etc.		

FORM CL-1

PROJECTED CLASS LABORATORY WEEKLY ROOM HOURS (WRH) AND WEEKLY STUDENT HOURS (WSH) BY SECTION SIZE (SS) AND TYPE OF CLASS LABORATORY

(1)	(2)	(3)	(4)
Type of Class Laboratory	Section Size (SS)	Weekly Room Hours (WRH)	Weekly Student Hours (WSH)
General Physics Lab	59	48	2,882
etc.			

5. Calculate Student Credit Hours (SCH) values for each course.

   Calculate the total number of Student Credit Hours for each course by multiplying the projected number of enrollments in the course by the corresponding Course Credit Hour value.

   Also calculate the number of SCH of "other" instruction by multiplying the number of course enrollments by the CCH value of "other" instruction.

6. Develop summary data.

   From the detailed data made available as outputs of these procedures, summarize the following information.

   (a) Weekly Student Hours (WSH) by department, course level, and type of instruction
   (b) Weekly Room Hours (WRH) by department, course level, and type of instruction
   (c) Total Student Credit Hours (SCH) by department and course level
   (d) Student Credit Hours (SCH) of "other" instruction by department and course level

   This is accomplished by summarizing data on courses of each level within each department. This information is basic to the projection of faculty requirements.

COMMENTS ON THE PROCEDURE

"Other" instructional activities seldom directly generate a requirement for scheduled facilities (i.e., they are field study or independent study activities which do not require use of classroom or class laboratory facilities). Such activities do, however, generate an important (and growing) element of faculty loads. The information on total Student Credit Hours of "other" instruction taught by each department is, therefore, necessary to the determination of faculty requirements. Such activities may also change the requirements for academic support facilities (e.g., increased use of independent study may create a need for additional study Stations in the library, larger numbers of freely scheduled small-group meeting rooms, and larger faculty offices for meetings with small groups of students).

Section 2.1.2

Program Planning

GENERALIZED PROJECTION OF INSTRUCTIONAL LOADS

DISCUSSION

The detailed procedures for projecting instructional loads and the associated detailed procedures for projecting the requirements for classroom and class laboratory facilities illustrate the realities of the phenomena that underlie the planning process. The detailed procedures reflect the complexities of the processes by which students enroll in particular courses and by which the patterns of instructional activities (different types of instruction and varying Section Sizes) finally emerge and take form. The detailed nature of these procedures and the way in which they reflect the decision-making processes make their use the means by which a planner can obtain an understanding of some complex, but basic, relationships. For this reason, if for no other, the novice planner (or the experienced planner in the process of becoming acquainted with the characteristics of an unfamiliar institution) should apply these detailed procedures at the outset of the planning cycle.

The amount of effort required to apply the detailed procedure in order to project instructional loads at a large institution will almost invariably lead the user to search for ways to simplify and shorten the procedures.

The following discussion is devoted to an explanation of some possible methods of simplification and their implications.

DATA TO BE DETERMINED

The following represents a minimum set of outputs to be obtained from a projection of instructional loads using generalized procedures.

1. Total Student Credit Hours (SCH) by department and course level within each department
2. Student Credit Hours (SCH) of "other" instruction by department and course level within each department
3. Classroom Weekly Student Hours (WSH) by department and course level within each department
4. Class laboratory Weekly Student Hours (WSH) by department and course level within each department

It should be noted that use of the less detailed procedures results in a loss of information on the distributions of WSH and WRH by Section Sizes. It yields only the total load (by department, course level, and type of instruction) without the additional information which allows direct calculation of the Station Count distribution of the classrooms and class laboratories required to house projected instructional load.

Furthermore, the data which allow determination of the extent to which class laboratory facilities can be shared (e.g., by more than one course) are not available as an output of this more generalized procedure.

PROCEDURE

1. Obtain projections of the numbers of students, categorized by majors and student levels.

   The enrollment projections used as the basis for this more generalized procedure are the same as those used for the detailed procedure as shown in Form P-1. If appropriate, the student characteristics may be aggregated to a greater degree than is indicated in Form P-1. In particular, the number of student levels may be reduced (to undergraduates and graduates, for example) if the mix of students within these broader categories is not expected to vary significantly. Aggregation of majors also is possible.

   As with the detailed procedures, if there are two or more identifiable subpopulations within the student body, it is suggested that enrollment projections be made independently for each subpopulation and that a separate Form P-1 be completed for each group.

2. Calculate instructional loads to be generated or induced by the projected student body.

   The central element in the calculation of projected instructional loads is a generalized Induced Course-Load Matrix (ICLM). The form of the ICLM used in the more generalized procedure is considerably different from that in the detailed procedures. First, the categories of student majors and student levels may be aggregated as indicated in Step 1. Second, the course data can be summarized. This summarization can be accomplished in various ways. Form P-5 illustrates a summary by departments and by course levels (i.e., all courses which are of the same level and which are offered by the same department are aggregated and, in effect, treated as a single course). Other methods of aggregation could result in summaries by department only, by course level only, by school or college and level, etc. The higher the level of aggregation, however, the more difficult the translation from instructional loads to class laboratory facilities requirements.

FORM P-5

GENERALIZED INDUCED COURSE-LOAD MATRIX*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Department	Course Level	Student Categories†						
		Major A		Major B			Major N	
		Undergrad.	Grad.	Undergrad.	Grad.		Undergrad.	Grad.
1	Lower	3.60 0.0 2.80 2.80	0 0 0 0	1.00 0 0.75 0.75	0 0 0 0	....	1.12 0 0.84 0.84	0 0 0 0
	Upper	0.15 0 0.15 0	0 0 0 0	1.50 0 1.50 0	0.20 0 0.20 0	....	0.60 0 0.60 0	0 0 0 0
	Grad.	0 0 0 0	0 0 0 0	0.22 0.22 0 0	2.20 2.20 0 0	....	0 0 0 0	0 0 0 0
2	Lower							
	Upper							
	Grad.							
3	Lower							
	Upper							
	Grad.							
.	. . .							
×	Lower							
	Upper							
	Grad.							
Projected No. of Students in Each Category								

*There are four entries in each cell—(a) total SCH, (b) SCH of "other" instruction, (c) classroom WSH, and (d) class lab WSH—that the average student of each major and student level takes in each department at the indicated course level.

†Student characteristics categories may be more or less aggregated than indicated; e.g., majors may be aggregated into the discipline divisions of the *Taxonomy of Instructional Programs in Higher Education.*

As a consequence of the aggregation of course data, the entries in the generalized ICLM must take a different form. The ICLM associated with the detailed procedures converts numbers of students to numbers of course enrollments. Then, knowing certain basic information about each course the necessary WSH, WRH, and SCH data about each course can be calculated. However, when the less detailed ICLM is used course enrollments are not calculated, and, therefore, the indirect link to WSH, WRH, and SCH data is removed. As a result, the entries in the ICLM must directly link numbers of students to the data required concerning Weekly Student Hours, Weekly Room Hours, and Student Credit Hours.

In order to obtain the required information regarding instructional loads for the calculations it is necessary that the following four elements be entered in each cell of the generalized ICLM.

(a) Average number of Student Credit Hours (SCH) generated by a student of each major and level in courses of each level within each department
(b) Average number of Student Credit Hours (SCH) of "other" instruction generated by a student of each major and level in courses of each level within each department
(c) Average number of classroom Weekly Student Hours (WSH) generated by a student of each major and level in courses of each level within each department
(d) Average number of class lab Weekly Student Hours (WSH) generated by a student of each major and level in courses of each level within each department

The analytic procedures required to determine the values for the elements in a generalized ICLM are discussed in Section 2.2. of this manual. Form P-5 illustrates an ICLM of this format.

Given the enrollment projections for the appropriate student categories and an ICLM of the form described, the calculation of total instructional loads is accomplished by multiplying each of the entries in the ICLM by the corresponding projected number of students and then summing the products for each course level within each department.

The end results of this calculation are

(a) Total Student Credit Hour (SCH) loads in courses of each level for each department
(b) Student Credit Hour (SCH) loads of "other" instruction in courses of each level for each department (a subset of a)
(c) Classroom Weekly Student Hour (WSH) loads in courses of each level for each department
(d) Class lab Weekly Student Hour (WSH) loads in courses of each level for each department

These data are summarized on Form P-6.

Note: For those institutions that have two or more definable subpopulations separate ICLMs and calculations of instructional load are recommended. Total SCH and WSH may be obtained by summing after the estimated loads generated by each group have been calculated.

It should also be noted that the projected number of graduate students engaged in research cannot be obtained directly as an output of these procedures. As a result an alternative method of estimating this factor must be found. It is suggested that the number of graduate students of each level engaged in research in each department is a relatively fixed percentage of the number of students enrolled in the degree programs associated with that department. By applying this percentage (as derived from historical data) to the projected number of students of each major and level the number of students engaged in research can be estimated.

FORM P-6

SUMMARY OF WEEKLY STUDENT HOURS BY TYPE OF INSTRUCTION, DEPARTMENT, AND COURSE LEVEL

(1)	(2)	(3)	(4)	(5)	(6)
Department	Course Level	Total SCH	SCH of "Other" Instruction	WSH of Classroom Instruction	WSH of Laboratory Instruction
1	Lower	2,487*	0	1,980†	1,980
	Upper	551	0	551	0
	Grad.	238	238	0	0
2	Lower				
	Upper				
	Grad.				
	.				
.	.				
	.				
X	Lower				
	Upper				
	Grad.				
Total					

Referring to the illustrative data contained in Form P-5
*2,487 = 3.60 (600) + 1.00 (280) + 1.12 (42)
†1,980 = 2.80 (600) + 0.75 (280) + 0.84 (42)

3. Calculate Weekly Room Hour (WRH) requirements.

Gross estimates of Weekly Room Hours (WRH) required can be calculated by dividing the projected Weekly Student Hours (WSH) of classroom and class laboratory instruction by the respective estimated Average Section Sizes (AvSS).

For classrooms all WSH can be aggregated and an overall AvSS applied, or separate estimates of AvSS for each course level or department (or combination of level and department) can be developed and WRH calculated on a relatively more detailed basis.

For class laboratories separate estimates of AvSS should be developed for each category of department and course level for which WSH data are available. This requirement is occasioned by the fact that the use of laboratories is confined to very few courses, whereas classrooms are institutionwide resources. While it is uncommon that all courses of a given level within a single department can share a single type of lab, these data represent the most detailed information available and must be used as proxies for data regarding courses taught in a particular type of class laboratory.

Form P-7 summarizes the Weekly Student Hour and Weekly Room Hour data for classroom and class laboratory instruction which have been calculated through use of these procedures. These data serve as inputs to the general planning methods presented in Manual Two.

As noted earlier, the primary failing of these methods is that they do not provide information regarding the distribution of Section Sizes, and, therefore, they do not serve to provide a firm basis for estimating the distribution of required Station Counts.

FORM P-7

SUMMARY OF WEEKLY STUDENT HOUR AND WEEKLY ROOM HOUR DATA BY DEPARTMENT, TYPE OF INSTRUCTION, AND COURSE LEVEL

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Classrooms			Class Laboratories		
Department	Course Level	WSH*	AvSS†	WRH	WSH	AvSS	WRH
							(8)=(6)x(7)
1	Lower	1,980	40	49.5	1,980	60	33
	Upper	551	30	18.36	0	0	0
	Grad.	0	0	0	0	0	0
2	Lower						
	Upper						
	Grad.						
	•						
•	•						
	•						
×	Lower						
	Upper						
	Grad.						
Total							

*From Form P-4.

†Estimate of AvSS determined on the basis of historical data or on the basis of subjective judgment.

Section 2.1.3

Program Planning

PROJECTION OF STAFF IN ACADEMIC DEPARTMENTS

DISCUSSION

The projection of numbers of staff in academic departments is particularly important to the calculation of requirements for office and research laboratory space. These projections pertain also to the determination of library and other academic support facilities needs.

There are four distinguishable steps involved in the process of projecting numbers of staff in academic departments and in organizing these data so that they provide a basis for the determination of office requirements.

Step 1. Determine the number of instructional staff required to meet the projected instructional loads in each department.
Step 2. Determine the number of faculty required to serve the research and public service programs.
Step 3. Determine the number of support employees required in each academic department.
tep 4. Organize the data to provide the information required for the projection of office facilities.

In order to ease the task of the reader each of these steps is discussed in a separate section. Although the section number for each remains the same, the section title indicates which of the steps is being discussed. Moreover, Step 1 may be accomplished in either of two ways. These are designated in the section titles as Method A and B.

The following terminology pertaining to categories of personnel is used throughout this section.

1. Staff in academic departments—all employees assigned to academic departments
2. FTE instructional staff—the full-time equivalence of those staff members assigned to instructional activities. This category is subdivided into
   (a) FTE instructional faculty
   (b) Graduate assistants (teaching)
3. FTE research faculty—the full-time equivalence of faculty (or faculty-level professional staff) assigned to research activities
4. FTE public service faculty—the full-time equivalence of faculty (or faculty-level professional staff) assigned to public service activities
5. Support employees—nonacademic employees, including such categories as clerical and secretarial employees, technicians, stock clerks, etc.

By way of summary the following data are to be determined as a result of these procedures.

- ►Projected number of FTE instructional staff by department and academic category
- ►Projected number of research and public service faculty
- ►Projected number of FTE support employees in each department
- ►Projected number of persons who require office space tabulated by
    - ●Department
    - ●Type of occupant
    - ●Degree of privacy

Section 2.1.3

Program Planning

PROJECTION OF STAFF IN ACADEMIC DEPARTMENTS

STEP 1: METHOD A

Determine the number of instructional staff required to meet the projected instructional loads in each department.

DATA TO BE DETERMINED

►Projected number of FTE instructional staff by department and academic category

Given the projections of instructional load developed in accordance with the previously described procedure, several methods can be used to estimate the number of FTE instructional staff required to service this load. Each of these techniques is designed to provide estimates of the instructional staff requirements of each academic department. The variations reflect differences in the staffing policies of various institutions.

Instructional staffing policies are expressed most commonly in terms of either Student Credit Hours per FTE instructional staff or Weekly Faculty Contact Hours per FTE instructional staff. However, at some institutions instructional staffing policies are expressed in terms of the average number of courses or Sections to be taught by staff members. A policy expressed in these terms can be converted readily into terms of Weekly Faculty Contact Hours per FTE staff. Other institutions establish instructional staffing policies on the basis of FTE Students per faculty member. A policy expressed in these terms can be converted readily into Student Credit Hours per FTE staff. Since the latter two methods of stating instructional staffing policies are generally equivalent to the more commonly used methods indicated above, they will not be considered separately.

This section deals with the calculation of FTE instructional staff when the instructional staffing policy is expressed in terms of Student Credit Hours per FTE instructional staff.

PROCEDURE

1. Summarize instructional load data expressed in terms of Student Credit Hours (SCH).

   The most discriminating set of staffing policies based on Student Credit Hours per FTE instructional staff member recognizes variations between departments and between levels of courses within these departments. As a result, in the most detailed situation projected SCH data correspondingly must be compiled by department and by level of course within each department. These data are readily available as a result of both the detailed and the more generalized methods of calculating instructional loads. One of the outputs of the detailed procedures is total SCH for each course (see page 14). These data can be summarized quite easily by department and by level of course within each department. Student Credit Hour data by department and course level are a direct output of the less detailed approach (indicated on page 18). Form P-8 provides a useful format for summarizing these data.

FORM P-8

PROJECTED STUDENT CREDIT HOUR LOADS BY DEPARTMENT AND COURSE LEVEL

(1)	(2)	(3)	(4)	(5)
	Student Credit Hours			
	Course Level			
Department	Lower	Upper	Graduate	Total
Physics	3,000	1,000	300	4,300
etc.				
Total				

2. Summarize instructional staffing policies.

   This step requires an explicit statement of the institution's policy regarding the number of Student Credit Hours which constitutes a full load for a faculty member. It is expected that such policies will be different from one department to the next and from one course level to the next. Form P-9 can be used to compile faculty-load information in a format consistent with the data on projected instructional loads.

Form P-9

Summary of Instructional Staffing Policies*
(Expressed as Student Credit Hours per Term per FTE Instructional Staff)

(1)	(2)	(3)	(4)
	Student Credit Hours per Term per FTE Instructional Staff		
	Course Level		
Department	Lower	Upper	Graduate
Physics	500	400	200
etc.			
Total			

*Policies expressed in terms of a single factor for a department can be reflected by inserting the same factor for each course level within that department. Policies expressed as a single factor for each level can be reflected by inserting the same factor for all departments on that course level.

3. Calculate the required number of FTE instructional staff for each department.

The number of FTE instructional staff required to service the demand for courses of each level within each department is calculated by dividing the projected number of Student Credit Hours at each course level and in each department by the assumed (or prescribed) number of Student Credit Hours per FTE instructional staff for the corresponding department and course level. The number of FTE instructional staff required in each department is calculated by summing across all course levels for each department. Thus the number of FTE instructional staff required in each department is calculated by dividing the number of Student Credit Hours entered in each part of Form P-8 by the corresponding value of Student Credit Hours per FTE instructional staff on Form P-9 and summing across course levels. The results are summarized in columns 2 through 5 of Form P-10.

FORM P-10

FTE INSTRUCTIONAL STAFF REQUIRED

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Course Level					
Department	Lower	Upper	Graduate	Total	Instn'l. Faculty	Teaching Assistant
Physics	6*	2.5†	1.5	10	8	2
etc.						
Total						

*6 = 3,000/500
†2.5 = 1,000/400

4. Subdivide the total number of FTE instructional staff into "Instructional Faculty" and "Graduate Assistant" categories.

   As a basis for projecting total faculty (including those engaged in research and public service) in each department and ultimately for purposes of determining facilities requirements, it is useful to have some information on the composition of the instructional staff. The most fundamental differentiation is between instructional faculty and graduate assistants. The subdivision of the number of FTE instructional staff in each department into these two groups can be based on ratios arrived at either as a matter of departmental policy or as a result of the analysis of historical data.

   Such ratios may be applied to the entire department staff (e.g., 80 percent of the department's instruction will be done by instructional faculty and the balance by graduate assistants) or on the basis of course level within each department (e.g., 60 percent of the lower-division courses will be taught by instructional faculty and 40 percent by graduate assistants and 100 percent of the upper-division and graduate-level courses will be taught by instructional faculty).

   Form A-11 is used to collect the historical data which can be used to develop these ratios.

   The base to which these ratios are applied is summarized in columns 2 through 5 on Form P-10. Columns 6 and 7 are used to summarize the results of this calculation.

Section 2.1.3

Program Planning

PROJECTION OF STAFF IN ACADEMIC DEPARTMENTS

STEP 1: METHOD B

DATA TO BE DETERMINED

Determine the number of instructional staff required to meet the projected instructional loads in each department.

►Projected number of FTE instructional staff by department and academic category

This section deals with the calculation of required FTE instructional staff when the instructional staffing policy is expressed in terms of Weekly Faculty Contact Hours per FTE instructional staff.

PROCEDURE

1. Determine Weekly Faculty Contact Hours according to institutionally appropriate categories.

   Instructional staffing policies expressed in terms of Weekly Faculty Contact Hours per FTE instructional staff may be differentiated by department and course level. In addition it is relatively common to include type of instruction (i.e., classroom, laboratory, or other) in the statement of policy. As a result, Weekly Faculty Contact Hour data must also be categorized by department, course level, and type of instruction.

   Weekly Faculty Contact Hours, a basic element in this procedure, usually are not calculated specifically as part of the projection of instructional loads. Instead, Weekly Room Hours are used as a proxy on the assumption that Weekly Room Hours are equivalent to Weekly Faculty Contact Hours for classroom and laboratory types of instruction (i.e., it is assumed that one hour of a faculty member's time is required for each hour of classroom or laboratory instruction). This is generally true although variations do occur in situations such as those in which one faculty member monitors two or more laboratory sections simultaneously. In situations in which this one-for-one relationship does not hold an adjustment (usually slight) must be made.

   While Weekly Faculty Contact Hours generally can be equated with Weekly Room Hours for classroom and laboratory types of instruction, no such equivalency exists for the "other" type of instruction. As a result, a substitute measure of instructional staff load must be employed. This substitute normally takes the form of Student Credit Hours. It is also possible to convert Student Credit Hours of "other" instruction to Weekly Faculty Contact Hours through use of a predetermined conversion factor.

The detailed procedures for calculating instructional loads yield Weekly Room Hours of classroom and class laboratory instruction categorized by department and course level and Student Credit Hours of "other" instruction also by department and course level. The more generalized procedures for calculating instructional loads also yield these data. Form P-11 represents one possible format for organizing these data.

FORM P-11

SUMMARY OF INSTRUCTIONAL LOADS BY DEPARTMENT, COURSE LEVEL, AND TYPE OF INSTRUCTION

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Lower-Division Courses			Upper-Division Courses			Graduate Courses			Total		
Department	* Clrm.	* Lab.	† Other	* Clrm.	* Lab.	† Other	* Clrm.	* Lab.	† Other	* Clrm.	* Lab.	† Other
Total												

*Entries are in terms of projected Weekly Room Hours.
†Entries are in terms of projected Student Credit Hours.

2. Summarize the institution's instructional staffing policy.

   This summary can be accommodated on Form P-12. The entries are the number of Weekly Faculty Contact Hours (or Student Credit Hours in the case of "other" instruction) considered to be a full-time faculty load for each department, course level, and type of instruction.

3. Calculate the number of FTE instructional staff.

   The number of FTE instructional staff required in each department is calculated by dividing the number of Weekly Faculty Contact Hours (the entries in Form P-11) by the corresponding number of Weekly Faculty Contact Hours per FTE instructional staff as determined by institutional policy (the corresponding entries in Form P-12). The results can be summarized in columns 2 through 13 on Form P-13.

FORM P-12

INSTRUCTIONAL STAFFING FACTORS‡

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Lower-Division Courses			Upper-Division Courses			Graduate Courses			Total		
Department	* Clrm.	* Lab.	† Other	* Clrm.	* Lab.	† Other	* Clrm.	* Lab.	† Other	* Clrm.	* Lab.	† Other
Total												

‡Expressed as number of Weekly Faculty Contact Hours (SCH in the case of "other" instruction) considered to be a full-time faculty load for the corresponding department, course level, and type of instruction.

*Entries are in terms of projected Weekly Room Hours.
†Entries are in terms of projected Student Credit Hours.

4. Subdivide the total number of FTE instructional staff into "Instructional Faculty" and "Graduate Assistant" categories.

This step is similar to that described as the final operation of the previously described method (see page 26). The only difference is the inclusion of "type of instruction" as a basis for differentiating between instructional faculty and graduate assistants. For example, it is possible to subdivide on the basis that all undergraduate laboratory courses will be taught by graduate assistants and that all other instruction will be assigned to instructional faculty.

Regardless of the nature of the process by which such differentiations are made, the basic data are included in columns 2 through 13 of Form P-13. The results of this subdivision can be summarized in columns 14 and 15 of this form.

FORM P-13

FTE INSTRUCTIONAL STAFF BY DEPARTMENT, COURSE LEVEL, AND TYPE OF INSTRUCTION

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Lower Division Courses			Upper Division Courses			Graduate Courses			Total			Instr'l. Faculty	T.A.
Department	Clrm.	Lab.	Other	Clrm.	Lab.	Other	Clrm.	Lab.	Other	Clrm.	Lab.	Other		
Total														

Section 2.1.3

Program Planning

PROJECTION OF STAFF IN ACADEMIC DEPARTMENTS

STEP 2

Determine the number of faculty required to serve the research and public service programs.

DATA TO BE DETERMINED

►Projected number of FTE faculty

The procedures described in the previous section yield projections of the number of FTE instructional staff required to serve the instructional programs of each department. For many institutions (possibly most) this number accounts for all faculty members. For other institutions, however, the instructional programs are not the only programs housed in academic departments. At these institutions much faculty time is devoted to organized research and public service programs. The amount of faculty effort devoted to these programs must be considered when the total number of faculty members in each department is being calculated.

The number of FTE faculty members to be engaged in research and public service within each academic department is extremely difficult to project directly. As a result, a common approach is to estimate the relative proportions of faculty effort devoted to each of the primary programs (instruction, research, and public service) and, knowing the number of FTE instructional faculty, calculate the remaining components.

PROCEDURE

1. Obtain projections of number of FTE instructional faculty.

   Projections of number of FTE instructional faculty in each department are produced as a result of the application of the procedures discussed in the previous section.

   These data are contained in column 6 of Form P-10 and in column 14 of Form P-13. It should be noted that teaching assistants are *not* included in this base number.

2. Estimate the distribution of faculty effort among programs (instruction, research, and public service) for each department.

   This step requires that estimates of faculty assignments for the target year be made (on a collective basis). Department chairmen are often the best source for such estimates. These estimates may be based on a departmental staffing policy (i.e., on the average, faculty members will devote half time to teaching and half time to research), or they may be based on an analysis of current faculty activities modified to reflect expected changes. These estimates can be summarized on Form P-14. As indicated on this form, the estimates should be expressed as percentages of the departmental faculty effort devoted to each of the primary programs of instruction, research, and public service. It should be noted that the categories indicated on Form P-14 pertain only to faculty (graduate assistants are excluded) and must be consistent with the categories of faculty contained on Forms P-10 and P-13. In particular, if the faculty categories on Forms P-10 and P-13 are subdivided in any way (e.g., between tenured and nontenured), then columns 2, 3, and 4 on Form P-14 should be similarly subdivided.

FORM P-14

PERCENTAGE OF FACULTY DEVOTED TO EACH OF THE PRIMARY PROGRAMS BY DEPARTMENT

(1)	(2)	(3)	(4)	(5)
Department	Instruction	Research	Public Service	Total
Physics	67%	33%	0	100%
etc.				100%
				100%
				100%

3. Calculate the number of FTE faculty in each department.

The projected number of FTE faculty in each department can be calculated by dividing the estimated number of FTE instructional faculty in each academic department (columns 6 and 14 of Forms P-10 and P-13 respectively) by the percentage of faculty effort devoted to instruction within that department (column 2 of Form P-14). If there is more than one category of faculty, this calculation should be made for each category. The results of this calculation are summarized in column 5 of Form P-15.

Once the total number of FTE faculty in each department has been calculated it is possible to use the information summarized on Form P-14 to determine the number of FTE research faculty to the number of FTE public service faculty. This determination is accomplished by multiplying the total number of FTE faculty in each department by the percentage of that department's faculty effort assigned to research and public service respectively. The number of FTE research and public service faculty is summarized in columns 3 and 4 of Form P-15.

FORM P-15

STAFF REQUIRING OFFICE SPACE BY DEPARTMENT

(1) Department	(2) FTE Instructional Faculty	(3) FTE Research Faculty	(4) FTE Public Service Faculty	(5) Total FTE Faculty (5)=(2)+(3)+(4)	(6) FTE Teaching Assistants	(7) Secretarial and Clerical Employees	(8) Other Support Employees

In addition to determining the number of FTE research faculty required, it is also necessary to estimate the head-count number of faculty members in each department who are engaged in research. As a result, the projected number of head-count faculty in each department and the number of these faculty members expected to be engaged in research should be calculated. These data can be obtained by

- ►Multiplying the FTE faculty estimate by the ratio of head-count faculty members to FTE faculty members for each department, and then
- ►Multiplying the resulting estimate of head-count faculty members by the proportion expected to be engaged in research.

Both of these steps require use of ratios which can be calculated from historical data and modified to reflect expectations of the future.

These calculations are summarized on Form P-16.

FORM P-16

NUMBER OF FACULTY ENGAGED IN RESEARCH

(1)	(2)	(3)	(4)	(5)	(6)
Department	Total FTE Faculty	Ratio of Head-Count to FTE* Faculty	Number of Head-Count Faculty (4)=(2)x(3)	Percent of Head-Count Faculty Engaged in Research†	Number of Faculty Engaged in Research (6)=(4)x(5)

*The historical data necessary to the calculation of this ratio are contained in Form A-9, Section 2.2.3.

†The historical data necessary to the calculation of this factor are contained in Form A-9 (Number of Head-Count Faculty) and in Form A-10 (Number of Faculty Engaged in Research), Section 2.2.3.

Section 2.1.3

Program Planning

PROJECTION OF STAFF IN ACADEMIC DEPARTMENTS

STEP 3

Determine the number of support employees required in each academic department.

DATA TO BE DETERMINED

- ►Projected number of clerical and secretarial employees in each department
- ►Estimated number of other support employees requiring office space in each department

A wide variety of support personnel is commonly employed in academic departments. Of the major groups, however, only the secretarial and clerical employees normally generate additional space requirements. Most employees in the other groups perform their activities in space which is determined by factors not directly tied to number of employees. For example, space for machinists and technicians is included as a part of the class laboratory or nonclass laboratory service space and is not separately calculated as a function of the projected number of machinists and technicians.

This situation, however, is not universally true. There are many cases in which stock clerks, technicians, and other support employees are provided with office space. The number of such situations varies widely from department to department and from institution to institution. As a result of this variation it is extremely difficult to establish any generally applicable method for the projection of the number of nonclerical support employees. Therefore only those techniques for projecting the number of office and clerical employees will be discussed. The projected number of other support staff requiring office space can be added as an exogenous input.

PROCEDURE

1. Establish a basis for projecting numbers of office and clerical employees.

   The almost universally accepted basis for projecting number of secretarial and clerical employees in each academic department is the number of FTE faculty in each. The procedures for projecting this data element were discussed in the previous section. The projected number of FTE faculty in each department is summarized in columns 2 through 5 of Form P-15.

2. Specify a clerical staffing policy for each academic department.

   This staffing policy may be either explicit or implicit. It usually takes the form of a ratio of faculty to clerical employees. An explicit policy statement would be one stating that "one clerical employee will be provided for every six FTE faculty in engineering and physical sciences departments and one for every nine FTE faculty in humanities and social sciences departments." An implicit policy statement uses current ratios of faculty to clerical employees as a projective basis. The analytic procedures for developing such current ratios are described briefly in Section 3.4. Regardless of the way in which they are developed, clerical staffing policies can be summarized on Form P-17. This form provides for the situation in which there are different clerical staffing policies for faculty and for teaching assistants. At many institutions graduate assistants are not provided with secretarial support.

3. Calculate the number of clerical employees required for each academic department.

   The projected number of clerical employees for each academic department can be calculated by dividing the projected number of FTE faculty in each academic department by the number of faculty members per FTE clerical employee. The results can be entered in column 7 of Form P-15.

4. Estimate the number of other support staff requiring office space.

   The number of other support employees requiring office space should be entered in column 8 of Form P-15. Given the absence of an adequate projective basis for such personnel, this entry must reflect the subjective judgment of the institutional officers. Form P-15 then becomes a summary of all employees in each academic department who must be provided with office space.

FORM P-17

RATIOS OF FTE FACULTY TO FTE CLERICAL EMPLOYEES FOR ACADEMIC DEPARTMENTS*

(1)	(2)	(3)
Department	Faculty†	Teaching Assistants‡
Physics	2	0
etc.		

*Entries are in terms of number of FTE faculty per each FTE clerical employee.

†Faculty should include appropriate subgroups if there are differential staffing policies for different groups.

‡This column is not used if teaching assistants are not provided with secretarial support.

Section 2.1.3

Program Planning

PROJECTION OF STAFF IN ACADEMIC DEPARTMENTS

STEP 4

Organize the data to provide the information required for the projection of office facilities.

DATA TO BE DETERMINED

►Projected number of staff who require office space tabulated by

- Department
- Type of occupant
- Degree of privacy

The preceding sections have described the procedures for projecting the number of staff of various categories required in each academic department. These data were summarized on Form P-15. However, they must be organized somewhat differently before they can be used in conjunction with the faculties planning procedures. The reorganization process is discussed in the following section.

PROCEDURE

1. Specify the office space categories to be used.

For planning purposes a minimum number of different types of office space appropriate to the needs of each academic department must be identified. A useful technique is to combine an indicator of Station size with an indicator of privacy required. The following categorization illustrates this.

(a) Department Chairman Office
(b) Private Faculty Office
(c) Two-Man Faculty Office
(d) Private Support Staff Office
(e) Multi-Station Support Staff Office
(f) Graduate Assistant Office

Degree of privacy is indicated by the words "private," "two-man," and "multi-Station" and implied by "department chairman" (private) and "graduate assistant" (multi-Station). A particular Station size can be associated with each of these categories. The office space categories reflect institutional office assignment policies and must be established for each institution.

2. Assign projected number of staff to office categories.

This step requires that the projected number of staff members in each academic department (as summarized on Form P-15) be assigned to one of the types of offices previously defined. In most situations this assignment is very straightforward. For example, the following guidelines could be followed.

(a) There is one department chairman's office for each academic department.
(b) All graduate assistants are assigned to multi-Station graduate assistant offices.
(c) Private support staff offices will be provided for one secretary in each academic department. All others will be assigned multi-Station support staff office space. In departments in which there are two clerical employees a two-Station office will be provided.
(d) Faculty will be provided with private offices.
(e) Other support staff will be provided with private support staff offices.

The assignment of the faculty to office space categories is generally the largest source of difficulty in this step. At some institutions full and associate professors are assigned to private offices and assistant professors and instructors are assigned to two-man offices. At many community colleges the relevant grouping may be contract faculty (who are provided with office pace) and hourly faculty (who are not). In such circumstances it is necessary to subdivide the faculty category into the components pertinent to the institution's office assignment policies. This subdivision can be accomplished at this point in the procedure or can be reflected in a subdivision much earlier in the procedure (indicated on Forms P-10 and P-13) and carried through to this point.

The results of this step are summarized on Form P-18.

FORM P-18

PROJECTED NUMBER OF EMPLOYEES IN ACADEMIC DEPARTMENTS BY TYPE OF OFFICE FACILITIES REQUIRED*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Type of Office Space Required						
		Faculty		Support			
Department	Chairman	Single Occupancy	Multiple Occupancy	Single Occupancy	Multiple Occupancy	Grad. Assistants	Total
Physics	1	11	0	1	2	2	17
etc.							

*Entries are in terms of number of FTE faculty per each FTE clerical employee.

Section 2.1.4

Program Planning

PROJECTION OF SUPPORT EMPLOYEES IN NONACADEMIC DEPARTMENTS

DISCUSSION

DATA TO BE DETERMINED

►Projected number of persons in each nonacademic department who require office space tabulated by

- Department
- Type of occupant
- Degree of privacy required

and adjusted for

- Multiple shift use

Support employees in nonacademic departments are housed in those facilities which historically have been labeled as Administrative and General Support space. The largest single component of space in this category is the office space required by administrative units. Most of the other types of facilities which can be collected under the general category of Institutional Support are quite specialized in nature and therefore not particularly suited to detailed projective techniques. Among the facilities which fall into this latter category are such things as central duplicating, receiving, and mail-room facilities. The element of program planning which is fundamental to the facilities planning problem, therefore, is estimating the number of employees for whom office facilities must be provided.

Estimating the numbers of employees in administrative departments is much less straightforward than projecting numbers of faculty and support personnel in academic departments. In academic departments the number of employees can be related functionally to one or more easily quantified indicators of load such as Student Credit Hours (SCH). In administrative units projections of only certain groups of employees can be calculated on the basis of a functional relationship with some other quantifiable measure. For example, the number of clerical employees in the registrar's office could be related functionally to the total number of students at the institution. For the most part, however, the required number of many types of administrative employees is determined largely by organizational philosophy, operating style of the chief executive officer, or institutional tradition. This situation is particularly common with regard to higher-level administrative personnel (or the nonacademic professional personnel) within the institution. For example, the number of staff members in the Planning Office, the Office of Public Relations, or the Alumni Office are determined more by operating philosophies and administrative priorities than by any other single factor.

The situation at most institutions is such that two very different sets of projective techniques must be used in combination in order to estimate the projected number of employees in administrative departments. One set of techniques is almost completely subjective; the other is much more objective and is based on establishing a functional relationship between the number of staff required and some other variable. In both cases the necessary final result is number of employees by type in each department who will require office space. For facilities planning purposes these data also must be categorized according to size of Station and degree of privacy required (i.e., single-occupancy vs. multiple-occupancy). This latter requirement can be satisfied only if policy regarding assignment of space is such that specific categories of employees can be identified as requiring a particular amount of space and if the number of employees in each category can, in fact, be projected. For example, if it can be established that secretarial and clerical employees are to be provided Stations in multiple-occupancy rooms, and if the number of clerical and secretarial employees can be projected, then it is possible to provide the necessary inputs to the facilities planning process.

The basic planning process for institutional support facilities therefore requires defining space categories, associating particular groups of employees with each of these space categories, and, finally, developing projections of numbers of employees in each group and in each department.

PROCEDURE

1. Specify the office space categories to be used.

   The categories to be specified should be differentiated by type of employee and type of space required. In most cases, four to six such categories should be enough to differentiate space requirements in sufficient detail for purposes of facilities planning. Without question the definitions of these categories will vary from one institution to the next. The following illustrates a possible set of office space categories.

   (a) Executive, Single-Occupancy—the type of office assigned to an executive officer or head of a major administrative department
   (b) Professional, Single-Occupancy—the type of office assigned to "middle-management," heads of second-level administrative departments, and other middle-level administrative professionals; a type of office which would be of the same approximate size as a single-occupancy faculty office
   (c) Professional, Multiple-Occupancy—the type of office assigned to lower-level professionals (for example, in some larger institutions buyers in the purchasing department could be placed in this category)
   (d) Clerical, Single-Occupancy—the type of office assigned to an executive secretary or to a secretary in a department having only a single clerical employee
   (e) Clerical, Multiple-Occupancy—the type of office space normally provided to secretarial and clerical employees in departments with two or more such employees
   (f) No Office Space—Many employees of administrative departments perform their activities in space which is generated by and required for other activities. Although such personnel may not influence facilities requirements, projection of the number of such employees is recommended in order to present a complete program planning basis for other institutional uses. An example of such an employee could be a receiving clerk or plant security officer; the former works in space generated by volume of merchandise, the latter works outdoors or in campus building space.

2. Project the number of employees in each department expected to require each type of space.

   The (current) inventory of personnel, discussed in Section 3. of this manual and summarized on Form A-12, provides the basis for projecting staff requirements. The process of projecting staff requirements primarily involves analyzing current staffing patterns as revealed by the inventory, describing a basis for projecting future requirements, and carrying out the projections.

Projection of the number of employees in nonacademic departments is a highly subjective process. Initially the personnel inventory illustrated in Form A-12 must be reviewed in order that the projective basis for each (potential) entry may be determined. As noted previously, this basis for projection may be either subjective or objective. Subjective projection deals with those groups of employees for which no formula-based methods of projections are applicable. Objective projection is used for groups of employees whose numbers can be projected on the basis of functional relationships with other identified variables.

Accordingly, it is necessary to

(a) identify those groups of employees whose numbers must be projected subjectively; and
(b) specify the formulas which are used to project the numbers of personnel in each of the other groups.

It should be noted that the techniques applied to projecting the required number of employees in any particular group may be markedly different from one institution to another. For example, the number of personnel administrators may be projected subjectively at a small institution, but may be functionally related to the number of clerical and support employees at a larger institution.

The end result of this rather intangible process is a projection of the number of employees of each category in each department. The results of this process may be summarized in Form P-19. Some additional information can be provided if separate forms are compiled for those employees for whom projection is subjective and those for whom projection is on the basis of some formula.

In estimating personnel needs for a new institution, there are no historical data which can be used as an analytic base. Under these circumstances it is necessary to complete a form similar to Form P-19 without benefit of hindsight. Working from an organization chart which summarizes the departmental structure is one way in which such estimates can be generated in basically the same way as previously described.

FORM P-19

PROJECTED NUMBER OF EMPLOYEES IN NONACADEMIC DEPARTMENTS BY TYPES OF OFFICE FACILITIES REQUIRED

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Types of Office Space Required					
		Professional		Clerical		
Department	Executive	Single-Occupancy	Multiple-Occupancy	Single-Occupancy	Multiple-Occupancy	Total
Total						

Section 2.1.5

Program Planning

PROJECTION OF NUMBER OF STUDENTS TO BE SERVED IN STUDENT SERVICES

DISCUSSION

DATA TO BE DETERMINED

►Projected total number of students in each of the institutionally specified categories

Program planning associated with projection of requirements for Student Service Facilities for the most part is little more than a restructuring of the enrollment projections. For purposes of projecting requirements for academic facilities, student level and major program are the important elements. Projecting requirements for residence, recreation, dining, and other Student Service Facilities demands an almost completely different set of student characteristics. Because the required information on student characteristics varies widely from institution to institution and because of different conditions and operating policies, this section will discuss only the general procedures.

PROCEDURE

1. Determine the student characteristics felt to be appropriate for calculating requirements for Student Service Facilities.

   Student characteristics such as sex, marital status, student level, and place of residence are frequently appropriate. In addition to these, special institutional housing policies may make it necessary to deal with other student characteristics. The existence of language houses makes the major program of the student a relevant characteristic. Participation in extracurricular activities becomes a meaningful characteristic if varsity athletes are provided special housing. Health care may be provided only to full-time students, thus making the "full-timeness" of students an important characteristic for projecting student health facilities. The possibilities are so numerous that any planning which recognizes such factors necessarily must be tailored for the particular institution. It is impossible to include all such variations in this generalized methodology.

   All institutions obviously will not require all data. Information on student sex is unnecessary for the institution which never will become coeducational. Housing policies may apply only to freshmen, thus eliminating level of student requirements other than "freshmen" and "all other."

2. Organize the enrollment projection data into the institutionally relevant student characteristics format devised in Step 1.

   Form P-20 illustrates one format for organizing enrollment projection data in a way which would meet the basic requirements for projecting requirements for Student Service Facilities at many institutions.

FORM P-20

PROJECTED STUDENT ENROLLMENT DATA
(BY CATEGORIES RELEVANT FOR PROJECTION OF STUDENT SERVICE FACILITIES)

(1)	(2)	(3)	(4)	(5)	(6)
Category	Level of Student	Single		Married	
		Male	Female	Male	Female
Come From Within Commuting Area	1				
	2				
	. . .				
	K				
Come From Outside Commuting Area	1				
	2				
	. . .				
	K				

Section 2.2.

PROGRAM ANALYSIS

Inasmuch as the role of program analysis is to support the decision-making and planning processes, its form is determined by the requirements of these processes. Whereas planning basically is concerned with the projection or estimation on the basis of certain relationships between the variables in the system, analysis is concerned with obtaining insight into these relationships through investigation of their historical form.

In the process of describing the program planning methodologies related to facilities, several areas were identified which required an analysis of historical data. While many of these areas are common to a large number of institutions, it must be recognized that what requires analysis at one institution may not at another (e.g., at some institutions the relationships between instructional loads and faculty requirements require analytic treatment, whereas at others this relationship is fixed by legislative formula).

In the discussion that follows an attempt is made to present the more common forms of analysis required in support of the program planning processes associated with facilities planning. Specifically, this section deals with

- ►Development of the Induced Course-Load Matrix
- ►Distribution of Instructional Activities by Section Size
- ►Inventory of Faculty and Analysis of Faculty Staffing Patterns
- ►Inventory of Support Staff and Analysis of Support Staffing Patterns
- ►Analysis of Residential and Dining Patterns

Section 2.2.1

Program Analysis

THE INDUCED COURSE-LOAD MATRIX

DISCUSSION

In order to project as accurately as possible the nature of the instructional load to be generated by students in the future, it is helpful to analyze the historical relationships between student characteristics and instructional loads.

At the most detailed level this analysis takes the form of an investigation of the characteristics of students (particularly the distribution by major and student level) enrolled in each course. The data required as a basis for this analysis are summarized on Form A-1. At those institutions in which distinct subpopulations of students have been identified,* it is recommended that data relative to each group be summarized on a separate form.

FORM A-1

COURSE ENROLLMENTS BY MAJOR AND LEVEL OF STUDENT*

Course Designation	Student Characteristics†													Total No. of Enrollments in Course‡
	Major A				Major B				//	Major N				
	Lower Div.	Upper Div.	Grad. 1	Grad. 2	Lower Div.	Upper Div.	Grad. 1	Grad. 2	....	Lower Div.	Upper Div.	Grad. 1	Grad. 2	
01.11	450	0	0	0	45	5	0	0	....	10	4	0	0	800
01.33	25	0	0	0	0	100	2	0	....	0	10	0	0	200
01.54	0	0	0	0	0	15	20	2	....	0	0	0	0	37
etc.														
Number of Students in Category	500	0	0	0	50	150	20	10	....	10	40	0	0	

*Each entry in the form is the number of students of each major and student level enrolled in each course.

†The categories of student characteristics should be the same as those on Forms P-1 and P-2.

‡Entries do not sum to totals because of omission of some of the majors in this particular illustration.

Thorough analysis of these data requires that they be gathered for a number of years and examined for stability or instability and for the pressure of identifiable trends. In order to convert the data contained on Form A-1 into data suitable for comparative analysis these data must be normalized (i.e., the entries must be converted from absolute values to decimal fractions). This is accomplished by dividing each entry by the total number of students in the corresponding category. The entries in the resultant table are the proportions of students of each major and student level enrolled in each course. This table is commonly referred to as a crossover matrix or an Induced Course-Load Matrix (ICLM). Form A-2 is an example of an ICLM.

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*Refer to page 6 for a discussion of this topic.

FORM A-2

DETAILED INDUCED COURSE-LOAD MATRIX*

Course Designation	Student Characteristics												
	Major A				Major B					Major N			
	Lower Div.	Upper Div.	Grad. 1	Grad. 2	Lower Div.	Upper Div.	Grad. 1	Grad. 2	....	Lower Div.	Upper Div.	Grad. 1	Grad. 2
01.11	0.90†	0	0	0	0.90	0.30	0	0	....	1.00	0.10	0	0
01.33	0.05	0	0	0	0	0.67	0.10	0	....	0	0.25	0	0
01.54	0	0	0	0	0	0.10	1.00	0.20	....	0	0	0	0
etc.													
Number of Students in Category	500	0	0	0	50	150	20	10	....	10	40	0	0

*Entries are proportions of students of each major and student level enrolled in each course.
†Referring to Form A-1: 0.90 = 450 course enrollments/500 lower division Major A students
0.50 = 25/500, etc.

For planning purposes, it is necessary to estimate the entries in the ICLM for the projection year. Quite obviously, developing a projected ICLM from scratch could be a prodigious task even for a small institution. As a result it is common to develop the ICLM for the current year and alter it selectively to arrive at an ICLM for the projection year. These selective alterations can be indicated in either of two ways.

1. Where specific curriculum changes can be identified, entries can be changed subjectively to reflect the expected effects of these changes.
2. Where analysis of historical data reveals trends, the entries in the ICLM can be changed to reflect the expected effects of these trends.

It is evident that the number of *possible* entries in a detailed ICLM can be exceedingly large even for a small college. Even recognizing that the *actual* number of entries will be only a small percentage of the number of theoretically possible entries, any thorough analysis of the ICLM at this level of detail requires a great deal of effort and may not be worth it. The magnitude of the problem may be so great as to mask any trends and make subjective alterations all but impossible.*

---

*In contrast, when developing specific plans for a single department, an analysis at this level of detail is almost mandatory. Use of less detailed data may not only hide certain relevant factors, but the determination of a satisfactory means of aggregation may actually make the process more difficult.

In view of this situation it is worthwhile to investigate ways in which data can be aggregated in order to obtain information which will be useful in many situations, but which will require less voluminous and detailed data. Some devices can be employed to reduce the amount of detail involved.

1. Reduce the number of student levels used. For example, at an institution with graduate programs the number of levels could be reduced to two (graduate and undergraduate); at a four-year institution it may be possible to dispense with student levels and categorize students only by major program.

2. Reduce the amount of course data by aggregating the departments offering the courses and by aggregating the data on individual courses by levels of courses (suggested levels are lower division, upper division, and graduate). In effect this aggregation results in treating all courses which are of the same level and which are taught by the same department or group of departments as a single course.

Form A-3 can be used to collect the basic data in this more aggregated form. It should be noted that the data to be entered on this form must be something other than course registrations since course registrations do not represent a uniform measure of instructional load which can be aggregated meaningfully. For example, a registration in one course may result in one credit hour's worth of activity while a registration in another course of the same level taught by the same department may result in four credit hours' worth of instructional activity. As a means of maintaining validity, therefore, the aggregation must be in terms of some data element which gives a true indication of instructional load for each course. Student Credit Hours and Weekly Student Hours are data elements which meet the requirements.

A thorough analysis requires inclusion of the following data elements in each cell of Form A-3.

►Student Credit Hours (SCH)
►Student Credit Hours of "other" instruction*
►Weekly Student Hours (WSH) of classroom instruction
►Weekly Student Hours (WSH) of class laboratory instruction

With these data available it is possible to perform a variety of analyses. In particular, it is possible to determine the nature of the instructional loads at each level of course and within each department.

As with the detailed data, the most productive analyses of these data are those in which data for a number of years are compared and trends and variations identified. In order for the data on Form A-3 to be compared over time, they must be normalized. Normalization is accomplished by dividing each entry on Form A-3 by the number of students in the corresponding category. The result is a generalized Induced Course-Load Matrix (ICLM) in which the entries are the average number of Student Credit Hours (or Weekly Student Hours) that a student at level (k) and major (m) takes in department (c) at course level (j). Form A-4 indicates one format for such a matrix.

---

*The Student Credit Hours of "other" instruction represent a subset of the total number of Student Credit Hours.

FORM A-3

SUMMARY OF INSTRUCTIONAL LOAD DATA*

(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)
Department	Course Level	Student Categories†							Total
		Major A		Major B			Major N		
		Undergraduate	Graduate	Undergraduate	Graduate	....	Undergraduate	Graduate	
1	Lower	1,800[a] 0[b] 1,400[c] 1,400[d]	0	200 0 150 150	0	....	56 0 42 42	0	3,200 0 2,400 2,400
	Upper	75 0 75 0		300 0 300 0	6 0 6 0		30 0 30 0		600 0 600 0
	Graduate			45 45 0 0	66 66 0 0				111 111 0 0
2	Lower								
	Upper								
	Graduate								
3	Lower								
	Upper								
	Graduate								
. . .	. . .								
X	Lower								
	Upper								
	Graduate								
Total Number of Students in Category		500	0	200	30	....	50	0	

---

*Four data elements are required for each cell. These elements are

[a] Total number of Student Credit Hours

[b] Total number of Student Credit Hours of "other" instruction

[c] Total number of Weekly Student Hours of classroom instruction

[d] Total number of Weekly Student Hours of laboratory instruction

In addition, data concerning the total number of students in each category are required to complete the bottom row of the form.

†Student Characteristics categories may be more or less aggregated than indicated.

A further type of simplification is to deal only with Student Credit Hours (SCH) on Form A-3 and to investigate the relationships between Weekly Student Hours (WSH) and Student Credit Hours in subsequent analyses. This allows deleting data on WSH by student level and major. As a result the process is one by which the impact on SCH loads in each department is analyzed and then WSH loads are investigated for each course level within each department. Unfortunately, this particular type of simplification can create inaccuracies since it erroneously assumes that, for example, 100 SCH in lower-division physical science courses represent the same proportions of laboratory and nonlaboratory WSH, whether induced by lower-division social science majors or by upper-division engineering majors. As a result, this simplification is not recommended. Instead, use of all four data elements as previously described is suggested.

FORM A-4

GENERALIZED INDUCED COURSE-LOAD MATRIX*

(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)
Department	Course Level	Student Categories						
		Major A		Major B			Major N	
		Under-graduate	Grad-uate	Under-graduate	Grad-uate	....	Under-graduate	Grad-uate
1	Lower	3.60 0.0 2.80 2.80	0 0 0 0	1.00 0 0.75 0.75	0 0 0 0	....	1.12 0 0.84 0.84	0 0 0 0
	Upper	0.15 0 0.15 0	0 0 0 0	1.50 0 1.50 0	0.20 0 0.20 0	....	0.60 0 0.60 0	0 0 0 0
	Graduate	0 0 0 0	0 0 0 0	0.22 0.22 0 0	2.20 2.20 0 0	....	0 0 0 0	0 0 0 0
2	Lower							
	Upper							
	Graduate							
3	Lower							
	Upper							
	Graduate							
. . .	. . .							
X	Lower							
	Upper							
	Graduate							
Total Number of Students in Category		500	0	200	30	....	50	0

*Calculate from the data contained on Form A-3. Referring to the upper-left-hand cell

(a) 1800/500 = 3.6 SCH of lower-division courses in department 1 taken by undergraduate students in Major A

(b) 0/500 = 0.0 SCH of "other" instruction

(c) 1400/500 = 2.80 WSH of classroom instruction in lower division

(d) 1400/500 = 2.80 WSH of laboratory instruction

FORM A-5

COURSE SECTION DATA*
CLASSROOMS ONLY

(1)	(2)	(3)	(4)
Course Section Designation†	WRH	Number of Students	Number of WSH (4)=(2)x(3)
01.01 Sec A	1	260	260
01.01 Sec B	1	300	300
01.01 Sec C	1	240	240
01.01 Sec 1	2	28	56
etc.			

*A separate line should be completed for each Section meeting in a classroom. For example, the illustration indicates a course which meets in large groups one hour per week and then meets two hours per week in smaller discussion groups.

†The course Section designation must serve to identify the level of the course and the academic unit in which the course is offered.

FORM A-6

COURSE SECTION DATA*
CLASS LABORATORIES ONLY

(1)	(2)	(3)	(4)
Course Section Designation†	WRH	Number of Students	Number of WSH (4)=(2)x(3)
01.01 Sec 1	3	44	132
01.01 Sec 2	3	40	120
01.01 Sec 3	3	49	147
etc.			

*A separate line should be completed for each Section meeting in a classroom. For example, the illustration indicates a course which meets in large groups one hour per week and then meets two hours per week in smaller discussion groups.

†The course Section designation must serve to identify the level of the course and the academic unit in which the course is offered.

Section 2.2.2

Program Analysis

DISTRIBUTION OF INSTRUCTIONAL ACTIVITIES BY SECTION SIZE

DISCUSSION

When instructional loads are projected through use of the most detailed Induced Course-Load Matrix (ICLM), distribution of Weekly Student Hours (WSH) and Weekly Room Hours (WRH) by Section Size can be obtained as a direct consequence of the projection process. However, when instructional loads are projected through use of a less detailed ICLM, the information on Section Size is lost as a consequence of aggregation. In such cases the information available is WRH and WSH by type of instruction, department, and course level. In order to estimate the number of classrooms and laboratories of each particular Station Count which will be required it is necessary to estimate the distribution of WRH of classroom and laboratory use by Section Size. Compilation and analysis of current data by Section Size range can provide a basis for estimating this distribution. Ranges of Section Size rather than exact Section Size are used in order to confine the amount to smaller intervals at the lower end of the scale and larger at the upper end. An illustrative range is 1-4, 5-9, 10-14, 15-19, 20-29, 30-39, 40-49, 50-59, 60-79, 80-99, 100-124, 125-149, 150-200. Ranges of any size can be used, including intervals of size one (i.e., exact Station Counts may be used).

Since classrooms are usually considered to be general assignment space while class laboratories are usually assigned for use by a single academic department, the methods of aggregating data for the two types of space are somewhat different. Therefore, the following discussion deals with these two types of space separately.

1. Classrooms

   Compilation of current classroom usage data by Section Size can be accomplished in various ways. For example, the compilation can be based on academic department, on course level, or on the combination of academic department and course level. In any event the raw data are the same and consist of

   (a) Course and Section designations (including information on course level and academic department offering the course)
   (b) Number of students registered in the course (Section)
   (c) Number of hours per week the Section meets (WRH)
   (d) Number of Weekly Student Hours (WRH × number of students)

   Most of these data are available on class (Section) lists. They can be listed on Form A-5. Some useful information can be obtained simply by analyzing the data entered in Form A-5. In particular, it is possible to gain some insight into the extent of variation in the Section Size within a single course.

   The data obtained according to the format of Form A-5 can be summarized in a variety of ways. The manner chosen depends on the prevailing situation at the particular institution. An attempt should be made to determine the form of aggregation which yields the most stability over time. A full analysis therefore requires that data be compiled in a variety of different ways over a period of years and the results compared. As indicated previously, the data can be aggregated by course level, by academic department, or by a combination of academic departments and course level. Form A-7 represents a means of aggregating the required data by course level.

FORM A-7

WSH AND WRH IN CLASSROOM BY LEVELS OF COURSES AND SECTION SIZE RANGES

Section Size Range	Lower Division Courses			Upper Division Courses			Graduate Level Courses		
	WSH	WRH	WSH/WRH*	WSH	WRH	WSH/WRH*	WSH	WRH	WSH/WRH*
200+	800	3	233						
20-29	1,600	64	25						
Total									

*WSH/WRH = Average Section Size

From the data available on Form A-7 it is possible to develop a distribution of WSH of classroom instruction according to Section Size and course level. In addition the Sections in the columns labeled WSH/WRH indicate the Average Section Size (AvSS) within each of the ranges.

2. Class Laboratories

The basic data on class laboratories also can be collected on Form A-6. Current class lab data must be aggregated by academic departments (as a minimum). Additional useful information is also obtained if the data are categorized by course level. For most institutions the amount of class laboratory data will be limited because a restricted number of academic departments require laboratory instruction, laboratory instruction is seldom required at more than two levels in any one academic department, and the laboratory sections tend to be distributed over very few size ranges in any academic department. Form A-8 can be used to collect the basic data concerning the distribution of WSH and WRH of laboratory Sections by academic department, course level, and Section Size range.

The information summarized on Form A-8 provides the basis for developing a distribution of the WSH of laboratory instruction according to ranges of Section Size, academic departments, and course level. The average size of the Sections within each range is included on Form A-8 (the columns labeled WSH/WRH).

The basic data required to complete Forms A-5, A-6, and A-8 are commonly available from an institution's Section lists. Such lists indicate the type of instruction (classroom or laboratory) and the size of the Section. This information and the additional element of number of hours per week that each Section meets are sufficient to complete these forms (assuming department and course level can be deduced from the course designation).

Form A-8

Weekly Student Hours and Weekly Room Hours of Class Laboratory Instruction by Academic Department, Course Level, and Section Size

Academic Dept.	Course Level		Section Size Range
			40-49
1	Lower	WSH	2,400
		WRH	51
		WSH/WRH	47
	Upper	WSH	
		WRH	
		WSH/WRH	
	Graduate	WSH	
		WRH	
		WSH/WRH	
.	.	. . .	
X	Lower	WSH	
		WRH	
		WSH/WRH	
	Upper	WSH	
		WRH	
		WSH/WRH	
	Graduate	WSH	
		WRH	
		WSH/WRH	

Section 2.2.3

Program Analysis

INVENTORY OF FACULTY AND ANALYSIS OF FACULTY STAFFING PATTERNS

DISCUSSION

In order to provide the foundation from which to project total departmental staffing requirements it is useful to summarize certain information resulting from an inventory of faculty and an analysis of their activities.

The first step in the process is development of a current inventory of faculty employed in each academic department. In such an inventory there are two items of particular interest, the individual's rank and his "full-timeness." Form A-9 serves to illustrate the nature of the data required by such an inventory.

Form A-9

Faculty Inventory*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Full-Time Equivalent						Head-Count					
Academic Department	Prof.	Assoc. Prof.	Asst. Prof.	Inst.	Grad. Asst.†	Total	Prof.	Assoc. Prof.	Asst. Prof.	Inst.	Grad. Asst.†	Total
#1	4	4.5	7.5	1	6	24	4	5	8	1	18	36
etc.												
Total												

*The categories of rank should coincide with those in use at each institution. Research and public service faculty as well as instructional faculty should be included.

†In the columns headed "Graduate Assistant" it is common to enter only that data which pertains to individuals engaged in instruction (i.e., graduate research assistants are excluded).

From the data contained on Form A-9, two types of analysis can be performed.

- ►Distribution of faculty by rank
- ►Relationships between FTE and head-count numbers of faculty

Both types of analysis have bearing on the facilities planning process. Since the amount of space assigned to faculty members often varies by rank, some knowledge of the distribution of faculty by rank is important. Further, since office space must be provided for individuals rather than full-time equivalents of individuals, information on the number of part-time faculty can be very useful in determining needs for office space. It is also helpful to be able to convert full-time equivalents to head-counts for purposes of determining requirements for parking facilities, dining facilities, and other facilities the use of which is determined by an individual's presence rather than by his work load.

Another element is the analysis of the distribution of faculty efforts. Specifically required is information on the way in which the faculty of each academic department distributes its time over the three primary programs of instruction, research, and public service. This information can be summarized on Form A-10. When these data are analyzed over time, it is possible to determine the changing program emphases in the various academic departments (e.g., the relative growth of research).

FORM A-10

DISTRIBUTION OF FACULTY EFFORT

(1)	(2)	(3)	(4)	(5)	(6)
Department	Instruction*	Research*	Public Service*	Total	Number of Faculty Engaged in Research†
#1	75%	20%	5%	100%	6
etc.				100%	
				100%	
				100%	

*Entries in columns 2, 3, and 4 should be percent of effort of the total *faculty* of each academic unit devoted to each of the three primary programs. The entries in these columns should total 100%.

†The entries in column 6 should be number of faculty members in each academic department engaged in research, regardless of extent of involvement.

It should be noted that this distribution of effort (or time) is for the faculty of an academic department collectively rather than individually. It is intended to be only a relatively gross indicator and can be based on such things as sources of salary dollars as well as surveys of individual faculty efforts.

A final step involves a somewhat more detailed analysis of the effort devoted to instruction. In particular, it is useful to determine the number of FTE faculty devoted to instruction of courses of each level within each academic department. Furthermore, it is useful to determine the distribution of effort between faculty and graduate assistants. These data can be recorded on Form A-11. When these data are analyzed in conjunction with instructional load data (such as that summarized on Forms A-3 and A-5), it is possible to obtain some information basic to formulation of faculty staffing policies. For example, it is possible to calculate ratios of

1. SCH/FTE faculty by level of course, and
2. Weekly Faculty Contact Hours/FTE faculty by level of course.*

Some institutions, most notably community colleges, have what amounts to two separate faculties (for example, a full-time or contract faculty for day classes and a part-time or hourly faculty for night classes). In such situations the facilities provided the two groups and the distribution of effort within the two groups generally is radically different. As a result, it is recommended that the required data for each group be compiled and summarized separately.

The analysis of faculty activities historically has been the subject of a great deal of study—and controversy. The result has been a proliferation of different techniques which can be employed to acquire the basic data necessary to complete Forms A-10 and A-11. There is a sufficient amount of published work in this area to make a detailed discussion in this manual unwarranted. See the bibliography for references on this subject.

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*This assumes that the number of WRH equals the number of Weekly Faculty Contact Hours or that the relationship between the two factors is known.

FORM A-11

DISTRIBUTION OF INSTRUCTIONAL EFFORT BY COURSE LEVEL*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Lower Division			Upper Division			Graduate		
Academic Department	Faculty	Grad. Asst.	Total	Faculty	Grad. Asst.	Total	Faculty	Grad. Asst.	Total
#1†	4	6	10	7.5	0	7.5	2	0	2
etc.									

*Entries are FTE faculty of each rank devoted to instruction of courses of each level.

†The total faculty FTE sums to 13.5 FTE faculty. It should be noted that this equals the percent of faculty effort devoted to instruction times the number of FTE faculty (i.e., 0.75 x 18).

Section 2.2.4

Program Analysis

INVENTORY OF SUPPORT STAFF AND ANALYSIS OF SUPPORT STAFFING PATTERNS

DISCUSSION

An inventory of an institution's current support staff* provides the information needed to project the number of support staff required at some future time. As background information for facilities planning, this inventory need include only two basic dimensions, the department with which an individual is affiliated and the nature of the individual's facilities requirements. Personnel data at most institutions, however, are usually kept in terms of positions or skill levels of employees and seldom, if ever, in terms of the nature of their facilities requirements. Since it is almost always preferable to use existing data, an inventory expressed in terms of departments and skill levels is most practical. Such a categorization can be accomplished in accordance with any one of a number of schemes, but requires certain understanding.

1. The categories must be constructed so that a single set of projection techniques and facilities requirements may be applied to employees in each category within each organizational unit.
2. The number of categories must be kept to a minimum in order to ease the burden of calculation.

Form A-12 illustrates one possible format for collecting personnel inventory data.

The skill level categories on Form A-12 are the categories described in the Fair Labor Standards Act.† Although any similar categorization can be used, this particular system has three advantages.

1. It is a standardized structure by virtue of its origin in federal legislation.
2. The data are available as a result of federal reporting requirements.
3. The categories are defined in a way which tends to eliminate the use of more than one projection technique for personnel within a given department and job category.

These categories are defined in Section 10 of the Fair Labor Standards Act.

There are some disagreements as to the nature of the data to be entered in Form A-12. Some argue for data entries in terms of FTE staff; others in terms of head-count staff. There are sufficient arguments on each side to warrant collection of both types of data.

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*As used here, "support staff" are all employees of an institution except faculty (with teaching assistants being considered faculty).

†WICHE-PMS Division is currently engaged in a project to develop a Personnel Classification Manual for higher education. It is recommended that when the project is completed the categories contained therein be considered as substitutes for the Fair Labor Standards Act categories listed here.

It is common to assign space to some personnel on the basis of head-count numbers. For example, it is common to assign an administrative office space for the sole use of a person who devotes only half-time to administrative functions. Such a practice can be justified on a number of grounds (function, location, appearances, etc.). Maintenance of head-count data allows accommodation to a variety of institutional conditions and policies. It also provides the basic data necessary to planning parking areas and similar types of facilities.

There are many activities which normally are performed by part-time employees, especially in the areas of service and clerical activities. Typically in such cases one work Station is provided for two or more part-time employees depending on how many hours (and which) each works. Thus there are situations in which FTE data are useful. In addition, the FTE data provide background information for budget projections and other administrative applications.

As a result of these considerations it is suggested that both FTE and head-count data be displayed in accordance with the format suggested in Form A-12. Both sets of data, or segments of both sets, are necessary for meaningful projection of the number of support personnel.

FORM A-12

INVENTORY OF NONACADEMIC SUPPORT STAFF BY DEPARTMENT AND FLSA* JOB CLASSIFICATION CATEGORY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	FLSA Classifications									
Department	Officials and Managers	Professionals (Nonacademic)	Technicians	Sales	Office and Clerical	Skilled Craftsmen	Operatives (Semiskilled)	Laborers (Unskilled)	Service Workers	Total
Total										

*Fair Labor Standards Act.

nce the personnel data are available in terms of job categories it is necessary that ey be rearranged to conform with the requirements of the facilities planning produres. On the assumption that the primary requirement of support employees is fice space the personnel data contained in Form A-12 can be rearranged to the rmat of Form A-13.

should be noted that there is not necessarily a fixed conversion of data in Form -12 to that in Form A-13. The conversion is carried out on a department-to-department basis with no requirement that the conversion be the same in all departments. or example, the nonacademic professionals in one academic department may require ivate offices, whereas the nonacademic professionals in another department may be ovided double-occupancy offices.

n the basis of the data summarized on Forms A-12 and A-13 a wide variety of fferent analyses can be performed. In particular, the staffing patterns of each different organizational unit can be investigated. Such analyses provide the basis for projective techniques discussed in Section 2. of this manual.

FORM A-13

OFFICE SPACE REQUIREMENTS OF SUPPORT EMPLOYEES BY DEPARTMENT* AND TYPE OF OFFICE SPACE NEEDED†

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Professional		Clerical				
Department	Executive	Single	Multiple	Single	Multiple	Other Space (Specify)	No Space Requirement	Total
otal								

All departments should be included.
It is suggested that forms be completed using both FTE and head-count data.

Section 2.2.5

Program Analysis

ANALYSIS OF RESIDENTIAL AND DINING PATTERNS

DISCUSSION

The analysis of the use of residential and dining facilities consists primarily of investigating the living and dining patterns of the subgroups of the student body identified in the program planning section.

Form P-20 (page 42) summarizes projected enrollment data in a format suitable for projecting requirements for most Student Service Facilities. If an institution has two distinct student bodies (for example, full-time students and part-time students) a separate form should be completed for each.

The analysis of historical data required to support planning methodologies for Student Service Facilities is based on a compilation of historical enrollment data in the format of Form P-15 (or the equivalent form used by the institution in program planning for Student Service Facilities). For reference purposes this form is repeated here as Form A-14. As a base, data regarding the total student body should be entered on this form. The next step in analyzing housing patterns is to complete a similar form showing characteristics of students currently living on campus. Given those two types of data, the percentage of each category of students currently living in institution-owned housing facilities can be calculated.

Analysis of demand for dining facilities is best accomplished through use of data normally collected as part of the daily routine in a food service operation. In particular, it is common to keep data on the number of diners served at each meal (often subdivided by contract and cash customers where appropriate). Operating arrangements normally are such that the total possible clientele for a dining hall is quite rigidly defined. For example, residents in a certain housing complex may be expected to eat in an associated dining hall. Knowing the total user group and the number that makes demands upon the dining hall for each meal, it is possible to draw some conclusions about dining patterns at the institution.

Note: The user group for some facilities may, of necessity, be defined as "all students not specifically assigned elsewhere." The analysis proceeds in the same fashion for this group.

FORM A-14

CURRENT NUMBER OF STUDENTS

(CATEGORIZED BY SEX, MARITAL STATUS, STUDENT LEVEL, AND RESIDENCE)

(1)	(2)	(3)	(4)	(5)	(6)
Category	Level of Student	Single		Married	
		Male	Female	Male	Female
Come From Within Commuting Area	1				
	2				
	· · · ·				
	K				
Come From Outside Commuting Area	1				
	2				
	· · · ·				
	K				

Section 2.3.

DATA REQUIREMENTS FOR PROGRAM ANALYSIS

INTRODUCTION

The analyses of an institution's current operations which have been described in Section 2.2. of this manual cannot be accomplished without the availability of the required data.

The following sections summarize, very briefly, the basic data required to provide the analytic foundation for the planning methodologies presented in this manual. This section does *not* list all of the data required for the various types of analyses commonly conducted at an institution (e.g., cost data are not included). Rather, this section should be viewed as indicating the minimum data file required as a basis for effective facilities planning. It should *not* be viewed as defining a recommended data file.

Section 2.3.1

Data Requirements for Program Analysis

STUDENT DATA

DISCUSSION

To support adequately the program analysis methodologies described in this manual, the following data should be available for each student enrolled at the institution.

- ►Major—degree program in which the student is enrolled. For students not officially enrolled in a specific degree program, an "undeclared" or "undecided" major should be indicated.
- ►Level—The WICHE *Data Elements Dictionary-Student* lists 12 student levels. These levels and a recommended aggregation into four levels for analytic purposes are as follows:

• Freshman	Lower Division Undergraduate
• Sophomore	
• Junior	Upper Division Undergraduate
• Senior	
• Fifth-Year Undergraduate	
• Undergraduate Special	
• Graduate Special	Graduate 1
• Master's Candidate	
• Professional Degree Candidate	
• Doctoral Candidate, early stage	
• Doctoral Candidate, last stage	Graduate 2
• Postdoctoral	

- ►Current course enrollments—the designations for each of the courses in which the student is enrolled. From this data it is possible to determine the full-time/part-time status of the student.
- ►Sex
- ►Marital status
- ►Home address—in particular, an indication of whether or not a student lives within commuting distance of the campus

Section 2.3.2

Data Requirements for Program Analysis

COURSE DATA

DISCUSSION

The following information concerning each course is required to provide the analytical basis necessary as a foundation for the facilities planning process.

- ►Organizational Unit—the academic department offering the course
- ►Course Level—The WICHE *Data Elements Dictionary-Student* lists five specific course levels. These five levels and the suggested aggregation for analytic purposes are

●Preparatory	Lower
●Lower Division	
●Upper Division	Upper
●Upper Division and Graduate	
●Graduate	Graduate

- ►Course Credit Hours (CCH)—the amount of credit offered for a course
- ►Weekly Contact Hours (WCH) of classroom instruction—the number of hours per week, per student, that the course meets for instruction in classrooms (lecture, recitation/discussion, seminar)
- ►Classroom Section Size (SS)—the desired or the maximum number of students per classroom Section. If a course is taught in such a way as to have classroom Sections of different sizes (e.g., lecture and recitation/discussion groups), it should be treated as two courses.
- ►Weekly Contact Hours of laboratory instruction—the number of hours per week, per student, that the course meets in laboratories
- ►Laboratory Section Size—the desired or maximum number of students per laboratory Section
- ►Course Credit Hours (CCH) of "other" instruction—the portion of the Course Credit Hours attributable to nonscheduled instructional activities (e.g., field trips, independent study, thesis, etc.)

possible collection form for these data is as follows:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Classroom		Laboratory			
Course Identifier*	Dept.	WCH	SS	WCH	SS	Total CCH	Other CCH
101[1]	Chem.	1	300	3	80	4	0
		2	20				
103	Eng.	3	30	0	0	3	0
501	Phys.	0	0	0	0	3	3
etc.							

*Must describe level of the course.

[1] Chem. 101 has both lecture and recitation—two entries required.

he above data are more or less "design" data. In addition, the following information eflecting the actual situation should be available for each section of each course urrently being offered.

►Type of instruction (classroom, laboratory, other)
►Weekly Contact Hours (WCH)
►Number of students enrolled in the Section

Section 2.3.3

Data Requirements for Program Analysis

FACILITIES DATA

DISCUSSION

The facilities data required are indicated in the *Higher Education Facilities Classification and Inventory Procedures Manual.* In summary the data required about each room are

- Organizational unit (department) to which the room is assigned
- Room type
- Function
- Area—in Assignable Square Feet
- Number of Stations—where appropriate

A *complete* building space inventory encompasses other data elements beyond these five key room attributes. Certain other elements are essential to overall space management and reporting needs; others are optional to suit the institution. Although facilities data requirements for program analysis purposes are limited herein to organizational unit, room type, function, area, and Stations, there are a variety of considerations and problems related both to these elements and to the total inventory which bear mentioning. Included are the person conducting the inventory, institutional consistency, and updating techniques.

RESPONSIBILITY FOR THE INVENTORY

The success and accuracy of any facilities inventory will depend largely upon the person or persons to whom the task is given. Institutional size and extent of reorganization or physical growth may affect whether or not a full-time "space man" is needed. Where at all possible, this is highly recommended. In many cases the responsibility for space management may rest with an administrator to be absorbed along with other major duties. Either way, the inventory generally is one part of the total space management responsibility tied in with ongoing reassignment, space efficiency or utilization studies, long-range forecasts, and recommendations of various kinds to the institution's executive officers.

Once the inventory responsibility is clearly assigned, it is essential for the person or persons performing the space survey to undergo adequate training and preparation for the task. Similarly, it is important for adequate time to be allotted in which to conduct the space inventory. A common mistake lies in assuming that anyone available can be assigned to the task, given the manual of classifications and procedures, sent out on the job, and expected to produce valid results. It is best to avoid the hiring of part-time help to accomplish this vital effort, particularly when the training may consist of one or two hours spent reading through the manual. Otherwise the end results may contain numerous and perhaps serious errors which will prove detrimental to the space management effort, the reporting process, and, therefore, to the institution.

The facilities resources of most institutions have substantial book value in dollars. They also tend to be constantly limited with demand exceeding the available supply. Proper space management systems and procedures are both prudent and essential to insure the most effective possible utilization of the valuable space resource. It is from this point of view that responsibility for conducting and maintaining the inventory should be assigned.

One of the important advantages of having a full-time staff member who is assigned to and well trained in space inventory is that this person will acquire an understanding of the various program activities of the institution and in-depth knowledge of the classifications, codes, and techniques. Conversely, a person who lacks such understanding and knowledge can be expected to produce erroneous facilities data which can have far-reaching disadvantageous effects upon the institution.

INSTITUTIONAL CONSISTENCY

The consistent use of a common set of facilities data—especially building names and abbreviations, building numbers, and room numbers—among the space manager, class scheduler, physical plant staff, departments, and on all printed materials such as maps and institutional directories can prove extremely beneficial and will prevent certain problems and inefficiencies from occurring.

In addition, the need for different square footage computations should be observed. The space manager will most often deal with Assignable Square Feet. The physical plant will tend to prefer "inside net" square feet, usually consisting of assignable, circulation, and rest room space since all of that area must be maintained with custodial, heating, and lighting services. Business and financial officers will use "gross" square feet of insurance and book value or financial report purposes. Each of these sets of figures should be maintained for each building, distinguished and identified whenever used, and the significance of differences recognized.

UPDATING TECHNIQUES

A continual updating process is generally to be preferred over a major once-a-year revision to the space inventory for several reasons, particularly where a noticeable amount of reassignment and remodeling occurs. Space can be managed with greater control if the correct figures are readily available. Space requests can be responded to and solutions effected more rapidly. Revised data entered by continual update can be more accurate than it would be if entered during a once-a-year "rush" job. Also, a once-a-year update can be such a massive job that part-time or other temporary help are called in, resulting in a greater probability of error.

Any number of updating record systems may be used. The important things are to be consistent, keep a complete historical record (not just one constantly changing data file which cannot be used to look back in time), and make the system as simple as possible. Accounting principles and institutionwide coordination are also significant.

A frequent problem in updating may be the inclination for some departments to effect changes in room type or room function within their assigned areas, without notifying the space manager or others. Similarly, physical plant may make certain changes without proper notification. By frequent inspection of each building, and perhaps the distribution, as necessary, of assigned room listings to departments for notation of any changes can help offset these kinds of problems.

In cases where new construction or remodeling spaces are soon to be occupied, advance updating can be prepared. Instead of waiting until occupancy takes place, all rooms can be coded ahead of time in accordance with the planned assignments. Inspection after the moves have taken place will reveal any last minute changes that might occur.

COMMENTS

A professional outlook on space management, serious concern with the space inventory, in-depth knowledge of the classification system, procedures and pitfalls of the inventory, and, finally, a good understanding of the programs conducted at the institution will go a long way toward establishing and maintaining a solid and reliable facilities data base.

Facilities data requirements for program analysis, if derived from a reliable file, will help insure the accuracy of the analytical results and of the subsequent program plan.

Section 2.3.4

Data Requirements for Program Analysis

STAFF DATA

DISCUSSION

For purposes of facilities analysis and planning, only a subgroup of the total institutional staff need be considered. In particular, only those staff members requiring office space must necessarily be "inventoried." However, in the interests of thoroughness it is suggested that *all* institutional staff be included in the data file. The data required for each staff member are

- ►Organizational unit—the department to which the individual is assigned
- ►Position*—the categories of positions are almost limitless. The WICHE *Data Elements Dictionary-Staff* includes a limited number of categories. These categories and possible further aggregations are as follows:
  - Faculty Rank Categories

(1) Teaching Assistant (2) Research Assistant (3) Teaching Associate (4) Research Associate	Graduate Assistants
(5) Lecturer (6) Instructor (7) Assistant Professor (8) Associate Professor (9) Professor	Faculty†

  - Support Staff Categories

(1) Officials and Managers (2) Professionals	Nonacademic Professionals
(3) Technicians (4) Craftsmen (skilled)	Technical
(5) Office and Clerical	Office and Clerical
(6) Operatives (semiskilled) (7) Laborers (unskilled) (8) Service workers (9) Apprentices	Other Support Staff

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*It is expected that these categories will be revised as a result of the WICHE-PMS Personnel Classification Manual project.

†May include those academic professionals who do not have faculty "rank" but who are faculty-level employees.

- ►Appointment percentage—percentage of full-time employment
- ►Requires office space—yes or no?
- ►Breakdown of activities for faculty members*—in particular
    - ●Distribution of effort among instruction, research, and public service
    - ●Listing of course (Section) assignments

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*Procedures for categorizing faculty activities are being developed as part of the WICHE-PMS Faculty Activity Analysis project.

Section 2.4.

PROGRAM PLANNING AND ANALYSIS

CONCLUSION

The program planning and analysis procedures which have been presented are specifically designed to support facilities planning at the institutional level. Similarly, the data required to support these procedures are those appropriate at the institutional level.

In the following section a system of facilities planning criteria designed for use at the systemwide or statewide level is proposed. This system is less detailed than the facilities planning procedures recommended for use at the institutional level. The corresponding program planning and analysis procedures which specifically support the systemwide facilities planning processes are not included. However, by proper selection and aggregation of the program planning data prepared for institutional use, those data necessary for systemwide planning can also be obtained. Therefore the program planning and analysis procedures serve institutional facilities planning directly and systemwide facilities planning indirectly.

As a final note it is suggested that one of the criteria which should be applied when designing any systemwide planning procedures is the extent to which the basic program data can be obtained from the results of the institutional program planning procedures. Section 3.1. of this manual summarizes the data required for use of the statewide facilities planning procedures. It is recommended that these requirements be viewed in the context of the institutional program planning procedures and the methods of determining the more generalized data determined.

Section 3.

SYSTEMWIDE FACILITIES PLANNING CRITERIA

INTRODUCTION

This section describes the use of systemwide facilities planning criteria—broad-gauge factors for the evaluation of institutional space requirements at systemwide or statewide levels for purposes of capital resource allocation.

Throughout these manuals, the emphasis is on the development of institutional-level facilities planning capability. The procedures and methodologies presented are designed specifically to aid institutional administrators in determining the capacities of the facilities currently available for use on their campuses and in projecting the additional facilities required by expected future developments. As a result of this institutional-level orientation, the methods are dependent on detailed data and place substantial emphasis on institutional policy. Successful and thorough planning at the institutional level requires both.

While the emphasis has been on institutionally oriented methodologies and on procedures to help institutions accomplish detailed, internal planning, other methods of evaluation must be available to those agencies responsible for obtaining or providing the resources necessary to implement these plans. No institution of higher education is an isolated entity; all must compete for limited resources in the same general arena, not only with each other, but also with other public service agencies. For public institutions and for those private institutions which are supported to a degree by public funds, the evaluation process is highly structured and operates through a coördinating council or some other state agency. For institutions seeking funds from private sources, the process is much more subtle, but just as real, and operates through philanthropic foundations, corporations, and private donors.

In either case, the final product of the detailed, institutionally oriented procedures for projecting facilities requirements is evaluated by an external agency. This evaluation can take many forms. In its simplest form, the evaluation is a subjective judgment or a superficial comparison of the results of the projections of those institutions competing for the available funds. In those instances in which the process is highly structured (primarily where public funds are involved), the evaluation commonly takes the form of an independent calculation of the facilities requirements against which the institutional projections are compared. This calculation is generally based on a standardized, and necessarily more generalized, set of procedures and planning factors.

There are good and sufficient reasons why the procedures and factors developed by the individual states or by state higher education systems must be unique and tailored to their specific needs. Statewide goals, objectives, and policies concerning the conduct of higher education differ noticeably from state to state. It is potentially misleading for institutions to borrow planning standards from other, noncomparable, institutions; it is equally inappropriate for statewide systems to borrow standards or norms from states which have different patterns of institutional characteristics and instructional styles.

There should be an effort within each individual state to develop a planning system which reflects the higher education goals and objectives and the unique array of institutional characteristics within that state's system of higher education.

In the past, standardized procedures and planning factors typically have been based on extensive analyses of historical data. From these data statewide averages were derived against which the data from individual institutions were compared and evaluated. This approach is based on two very tenuous assumptions. First, it assumes that current or historical conditions provide the basis for developing standards to be carried forward into the future; it assures that the mistakes and inequities of the past will be perpetuated in the future. Second, the use of averages masks interinstitutional differences. The dogmatic use of a single value, such as the mean of a range of possible values, assumes that the variances around this single value are invalid. This failure to recognize the legitimacy of variance can work undue hardships on certain institutions. In effect, this approach puts the forward-looking planner in the awkward position of going through the world looking backward.

The primacy of the average has two unfortunate consequences. First, it focuses attention on a single value and draws attention away from the significance of the range of values which extend on either side, sometimes widely. Second, the use of averages can obscure the existence of some very important trade-off possibilities. The first consequence is especially important in the application of evaluative criteria on an interinstitutional basis. The second is particularly influential at the intrainstitutional level.

Failure to recognize the nature of the variance around the average has led to inconsistent application of many evaluative criteria. In those situations in which variations have been in the direction of less than average requirements for capital resources (less-than-average space needs or higher-than-average utilization) the variations are normally accepted without question. Conversely, when the variations have been in the opposite direction, acceptance is not so unquestionably forthcoming. In effect variations in only one direction (the direction of less-than-average resource requirements) are recognized as having validity. The result is a strong tendency toward homogeneity. Every institution is forced to approximate the average or less, which may result in many kinds of unanticipated inefficiencies. Those institutions operating "below average" (in cost) tend to become more nearly average (and thereby more expensive). Those operating "above average" are forced toward the average (sometimes at the expense of the educational program). The savings obtained at the expense of those institutions operating "above average" may be more than offset by failure to realize savings from those institutions operating at or below the average. A thorough understanding of the nature of, and reasons for, the variations around the average could result in a distribution of an equal amount of resources in a way which more equitably recognizes the differing needs of different institutions.

Application of evaluative criteria in a way which does not accommodate the existence of trade-off situations may, in the long run, prove even more costly. Use of "average" criteria is normally on a room-type-by-room-type basis (i.e., the aim is to be "average" for each type of space rather than for the total for all types of space). Development of those innovative instructional techniques which result in a greater-than-average requirement for one type of space and a lesser-than-average requirement for a second type is stymied. More subtle is the situation in which a greater-than-average requirement for a particular type of space is substituted for lower operating expenses. In most instances, the nature of the evaluative process precludes use of such compensating variations. Rigidity in the application of evaluative criteria thus may contribute to lack of innovation as well as less-than-efficient operation. Promotion of innovation in both instruction and management requires acceptance of some degree of interinstitutional variation.

In order to overcome the deficiencies inherent in an evaluation process based on standards derived from historical data, it is necessary to construct individual statewide planning systems on the basis of what is desirable and necessary, rather than on the basis of what is or has been. Construction of such a system requires that the affected parties, together, attempt to define the form of the system, investigate the problem areas associated with the use of historical data, analyze those situations in which institutional variations are apparent, and, in the end, reach some sort of consensus as to the details of an evaluation process which can be applied equitably in the future. The development of such a system requires compromise. It also requires open-mindedness and the willingness to recognize the need of all parties for a product which is both sensible and fair.

As indicated previously, the form of such a statewide system logically will vary from state to state. However, several basic requirements must be satisfied before any such system can operate effectively and to the desired end.

The basic requirements which must be satisfied are

- ►The process must be more generalized than that which is applied at the institutional level. It is a waste of time and resources to attempt to duplicate an institution's planning process outside of the institutional setting. The evaluative process must be based on the consideration of a smaller number of independent variables.
- ►The process must allow for those legitimate differences which exist between institutions and which result in differing facilities requirements. Any system which is based on a single, fixed criterion for each type of space for all types of institutions generally is inappropriate.
- ►The data elements included in the calculations must be defined very explicitly. In addition, the data must be available or readily derivable from those which should be available for use by the institution for its ongoing planning and management operations.
- ►The process must be explicit regarding what is to be included and what is to be excluded. If the techniques which permit a general assessment of the requirements for some types of space are not available, this should be specifically noted.

In addition to these requirements, there are two fundamental, operational requirements.

- The procedures must permit the institution which exceeds the limits set by state-agency criteria to present its own, more detailed data as the basis for justifying its deviation from the norm. This is not to suggest that the institution is always "right" in such situations; rather, it recognizes that no generalized planning or evaluative process can reflect all the nuances of the institutional situation and that complete dependence on an imperfect system is unwise and unwarranted. Accordingly, these evaluative processes should be used to define areas requiring further discussion rather than to provide a final, unilateral answer. Further, where "excess" facilities in fact exist, the institution must be granted sufficient time and resources to "correct" such situations.
- It must be acknowledged that systemwide facilities planning criteria used in the evaluative process cannot be applied to the design of specific facilities. There must be some allowance for flexibilty since no gross indicator is

> sufficiently sensitive to reflect varying requirements created by differing programs, philosophies, modes of operation, functions to be served, and architectural considerations. A stipulation that the actual amounts of th various types of space within a building, as designed, agree with those derived by the application of systemwide facilities planning criterion can do nothing but hinder the creation of a facility which is tailored to an institution's particular needs. The stewardship function can be sufficiently exercised if the only requirement is that the total amount of space in a building is held within the limits set. Concern with the pieces is unnecessary.

In both the development and use of the systemwide facilities planning criteria, emphasis should be placed on protecting institutional incentives for excellence and innovation while maintaining the degree of control consistent with the stewardship role. Such incentives can be provided by allowing institutional administrators to divert resources made available through extraordinary efficiencies of operation in one area to improvement or experimentation in other areas. There should be a reward, not punishment, for superior performance.

In an effort to illustrate the form of a system of generalized planning criteria which meets the requirements outlined above, a proposed system is presented on the following pages. It is intended as a starting point for further development. Because the requirements of the various users may differ from this system, it is suggested that it not be adopted for use without careful analysis and possible modification. It should be indicated, however, that the form of this particular system and the quantitative values recommended have been developed by individuals most knowledgeable concerning the present state-of-the-art of facilities planning. The use of quantitative values substantially different from those presented should be based on extensive analysis of institutional program requirements and a thorough understanding of their interrelationships.

Section 3.1.

Systemwide Facilities Planning Criteria

GENERAL FORM OF THE SYSTEM

DISCUSSION

The general framework of the proposed system is constructed of two elements, room types and functions. While room type is the basic element in the system, inclusion of the function element creates an array which can serve incidentally as a checklist to insure that none of the necessary space is overlooked.

In order to have a generally usable system it is necessary that this framework be constructed of consistently defined elements. The room type categorization used here is that contained in the U.S. Office of Education *Higher Education Facilities Classification and Inventory Procedures Manual* and the function categorization corresponds to the programs defined in the WICHE *Program Classification Structure: Preliminary Edition* (1970).

Table 1 is an array of those room types and functions (programs). The numbered boxes represent the six types of space with which the system deals specifically, omitting the two room types (medical care and residential) which the system does not include. They also serve to describe the basic interrelationships between room types and functions.

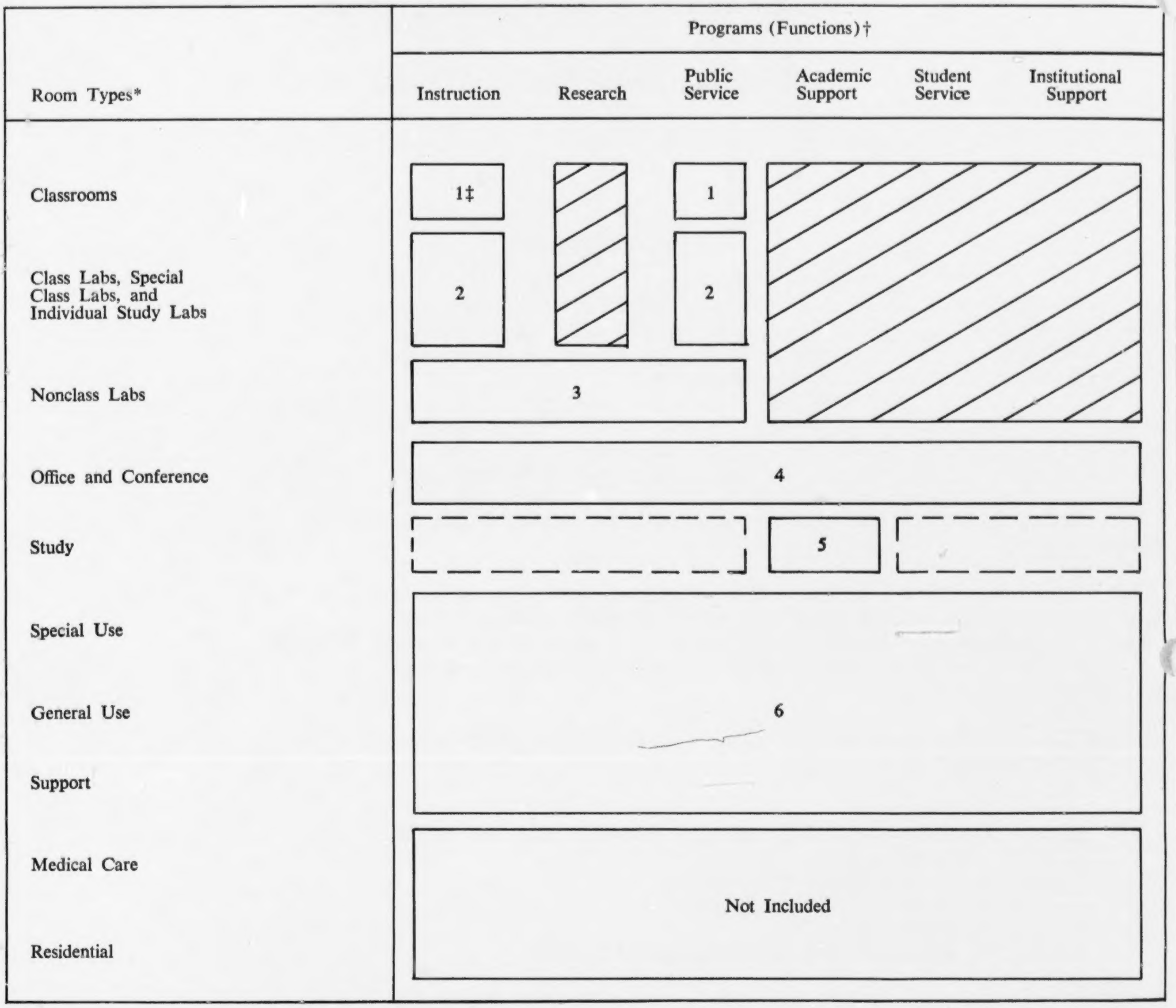
As is indicated on Table 1, the proposed system of general planning criteria covers six categories of facilities.

Category 1—Classrooms
Category 2—Class Laboratories (including individual-study and special laboratories)
Category 3—Nonclass (Research) Laboratories
Category 4—Office and Conference Facilities
Category 5—Study Facilities
Category 6—Special Use, General Use, and Support Facilities

Different forms of planning criteria are appropriate to each of the different categories of facilities. The systemwide facilities planning criteria recommended for each category are discussed in succeeding sections of this manual.

TABLE 1

INTERRELATIONSHIPS BETWEEN ROOM TYPES AND PROGRAMS



Room Types*	Programs (Functions)†					
	Instruction	Research	Public Service	Academic Support	Student Service	Institutional Support
Classrooms	1‡	▨	1	▨	▨	▨
Class Labs, Special Class Labs, and Individual Study Labs	2	▨	2	▨	▨	▨
Nonclass Labs	3			▨	▨	▨
Office and Conference	4					
Study	— — —	— — —	— — —	5	— — —	— — —
Special Use	6					
General Use						
Support						
Medical Care	Not Included					
Residential						

Key: ————— Primary Relationships

— — — — Secondary Relationships

▨ No Relationships (Generally)

*As categorized in the *Higher Education Facilities Classification and Inventory Procedures Manual.*

†As categorized in the WICHE-PMS *Program Classification Structure.*

‡Numbers refer to the space category in which criteria are discussed.

Section 3.1.1

Systemwide Facilities Planning Criteria

SPACE CATEGORY 1: CLASSROOMS

SUGGESTED FORM OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

►Assignable Square Feet (ASF) per Weekly Student Hour (WSH) of classroom instruction

RATIONALE

This planning criterion is suggested because Weekly Student Hours are the most direct indicator of the amount of classroom activity to be accommodated.

A systemwide facilities planning criterion of Assignable Square Feet per Full-Time Equivalent Student (ASF/FTE Student) also is useful because the additional step of calculating Weekly Student Hours can be eliminated. However, the classroom load represented by an FTE Student can vary substantially from one institution to the next; this criterion is, therefore, not appropriate in situations which require comparable data.

APPLICATION OF THE GENERAL PLANNING CRITERION

The planning criterion of Assignable Square Feet per Weekly Student Hour of classroom instruction is a composite of three elements.

$$\text{ASF/WSH} = \frac{\text{(Assignable Square Feet per Station)}}{\text{(Room Utilization Rate)} \times \text{(Station Occupancy Ratio)}}$$

$$\text{ASF/WSH} = \frac{\text{(ASF/N)}}{\text{(RUR)} \times \text{(SOR)}}$$

The quantitative values of each of these elements are variable, within limits, from institution to institution.

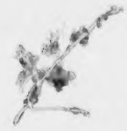
The extent of and reasons for the quantitative variations of each element are as follows:

►Assignable Square Feet per Station (ASF/N)

Classrooms with fewer Stations require more floor area per Station because the circulation space is proportionately greater. The shape of the room also affects the floor area per Station. The following formula is a good rule of thumb for estimating the Assignable Square Feet per Station, either in a single classroom or (with greater accuracy) for the average of several classrooms of a wide range of sizes.

$$\text{ASF/N} = (9) + (240)/(\text{N/R})$$

N is the total number of Stations and R is the number of rooms.



By this formula

ASF/N = approximately 21 Assignable Square Feet per Station fo classrooms averaging 20 Stations

ASF/N = approximately 17 Assignable Square Feet per Station for classrooms averaging 30 Stations

ASF/N = approximately 15 Assignable Square Feet per Station for classrooms averaging 40 Stations

ASF/N = approximately 12 Assignable Square Feet per Station for classrooms averaging 80 Stations

ASF/N = approximately 11 Assignable Square Feet per Station for classrooms averaging 120 Stations

Accordingly, institutions with classrooms averaging fewer Stations (normally the small institutions) will have a greater average Station area than institutions with classrooms of greater average number of Stations.

The average Station area for all the classrooms of an institution generally should fall in the range of 14 to 18 Assignable Square Feet per Station (ASF/N).

►Room Utilization Rate (RUR)

The number of hours per week that an average classroom can reasonably be scheduled typically varies from 25 to 30 daytime hours. Within this range, the higher rates typically are achieved by the larger institutions. At the smaller institutions the greater incidence of potential conflicts in the students' schedules usually requires more flexible scheduling and thus a lower overall Room Utilization Rate.

A range of 25 to 30 weekly hours of daytime classes per classroom should be appropriate for most institutions. This suggested range of 25 to 30 hours per week of classroom use is based on a normal operating week of from 40 to 45 hours. Institutions which achieve higher Room Utilization Rates do so by including evening hours of use in the normal operating week. It is not sensible to assume that all institutions can schedule classrooms more than an average of 30 hours per week; nor, even if a given institution can do so, that class sizes, operating costs, and other daytime factors can be extended unchanged into the evening. Therefore, higher rates are not recommended, although some institutions can and do achieve them.

►Station Occupancy Ratio (SOR)

Typical values of the Station Occupancy Ratio are in the range of 0.55 to 0.67. The exact value achieved at a given institution is influenced by the degree to which the distribution of Section Size conforms to the distribution of Station Counts. There is also a trade-off between the Room Utilization Rates (RUR) and the Station Occupancy Ratio (SOR). If the RUR is particularly high, it is generally achieved by putting small classes in large rooms, thereby reducing the SOR. Conversely, if the SOR is especially high, it is generally achieved by allowing lower RUR to occur. The SOR is affected also by the distribution of Station Counts (SC) (i.e., it is more difficult to maintain a consistently high SOR in large rooms, and the few large rooms disproportionately affect the overall ratio).

As a result of such considerations, legitimate differences between the Station Occupancy Ratios of different institutions must be acknowledged. Average values in the range of 0.55 to 0.67 should be deemed acceptable in most institutions.

By combining the values which represent the limits of each element, a value of 0.70 ASF per WSH* is attained at one extreme and 1.31 ASF per WSH† at the other.

However, as noted previously, there are certain trade-offs which generally prevent an institution from achieving the maximum value for each element (e.g., if high values of SOR are achieved, lower values of RUR normally result). As a result, neither of these extremes is common.

Values of ASF per WSH in the range of 0.80 to 1.20 usually are most appropriate. The exact value (or range) appropriate for a given institution depends on the characteristics of that institution.

COMMENTS

Classrooms have a variety of uses in addition to those associated with degree program instructional activities. In particular, many public service activities such as short courses and symposiums require classroom space (as indicated in Table 1). Generally, however, such activities can be accommodated in the unscheduled hours if the Average Room Utilization Rate does not exceed 30 hours per week. An unusually large amount of nonscheduled use may, in some instances, justify an Average Room Utilization Rate (AvRUR) of less than 30 hours per week.

An allowance for classroom service space (e.g., coat rooms and preparation rooms) is included in the space factor.

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*$0.70 = \frac{(14)}{(30) \times (0.67)}$

†$1.31 = \frac{(18)}{(25) \times (0.55)}$

Section 3.1.2

Systemwide Facilities Planning Criteria

SPACE CATEGORY 2: CLASS LABORATORIES

(Including Special and Individual Study Laboratories)

SUGGESTED FORM OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

►Assignable Square Feet per Weekly Student Hour of laboratory instruction

RATIONALE

This particular planning criterion is suggested because the number of Weekly Student Hours of laboratory instruction is the more direct indicator of the amount of activity requiring instructional laboratory facilities. As a result, the corresponding performance measurement (actual ASF per laboratory WSH) is appropriate for interinstitutional comparisons.

APPLICATION OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

Instructional laboratory facilities are not readily interchangeable among academic programs and often not among course levels within a single academic program. As a result, the criterion generally should be applied at the course level within each program, rather than at the institutional level.

The quantitative values of each of the elements of this criterion [Assignable Square Feet per Station (ASF/N), Room Utilization Rate (RUR), and Station Occupancy Ratio (SOR)] vary by academic programs and by course levels. The extent of these variations and the reasons for their occurrence are as follows:

►Assignable Square Feet per Station (ASF/N)

The nature of the laboratory furniture and equipment is the primary cause of variation in class laboratory Station areas. Equipment requirements vary both by academic program and by course level. The greater Station area criteria for upper division and graduate level laboratories reflect the need to provide space for the more specialized equipment and the more elaborate experiments.

Table 2 shows ranges of Assignable Square Feet per Station for each academic program and course level. The listed academic programs are the discipline categories as defined in *The Taxonomy of Instructional Programs in Higher Education.*

TABLE 2

FLOOR AREA CRITERIA FOR CLASS LABORATORIES
ASSIGNABLE SQUARE FEET PER STATION (ASF/N)*

Academic Programs	Assignable Square Feet per Station	
	Lower Division	Upper Division and Graduate
Agriculture and Natural Resources	60-70	60-70
Engineering	50-90	75-125
Architecture and Environmental Design Biological Sciences Fine and Applied Arts Home Economics Physical Sciences Psychology "Lab" Social Sciences (Typically Geography, Archeology, Criminology, Anthropology)	55-65	85-95
Communications	35-45	55-65
Education (Excluding Physical Education)	30-50	30-50
Area Studies Business and Management Computer and Information Sciences Foreign Languages Letters Library Science Mathematics Military Science Public Affairs and Services "Nonlab" Social Sciences (Typically History, Economics, Sociology, International Relations, Demography, Urban Studies, Black Cultural Studies, Mexican-American Studies)	25-35	25-35
Interdisciplinary	**	**

Technical—Vocational	Assignable Square Feet per Station
Business and Commerce Technologies	25-35
Printing, Photography, and Graphic Arts	55-65
Hotel and Restaurant Management	55-65
Transportation and Public Utilities	125-175
Data Processing Technologies	50-80
Health Services and Paramedical (except Physical Therapy)	40-60
Physical Therapy	90-110
Mechanical and Engineering Technologies (except Graphics and Drafting)	120-160
Graphics and Drafting	55-65
Natural Science Technologies	40-60
Public Service Related Technologies	25-35

*Including the floor area of related service rooms.

**Values for "interdisciplinary" courses may be obtained by combining factors of the various academic programs from which the interdisciplinary courses are derived.

►Room Utilization Rate (RUR)

Variations in the Room Utilization Rate are related primarily to course level, to certain academic programs, and to the ability to schedule multiple Sections of one course.

The variations by course level are attributable primarily to two phenomena. First, upper-division courses normally require a greater amount of nonscheduled use because students in these more advanced courses are expected to spend more time pursuing special research interests than are students enrolled in lower-division courses. Second, there is often a definite need for very specialized advanced courses which generally enroll a small number of students. Typically, the enrollment in the course will vary greatly from year to year. In spite of a low Room Utilization Rate the room which serves this course is required by the academic program and must be made available as long as that program is offered. These systemwide facilities planning criteria deal with averages, and, on the average, facilities serving upper-division courses, because of their specialized nature, are used fewer hours per week.

Generally the RUR for facilities housing lower-division courses should be in the range of 22 to 26 scheduled daytime hours per week with the more prevalent value being 24 hours per week. The RUR for class laboratories which house upper-division courses should be in the range of 14 to 18 scheduled daytime hours per week with 16 being the most common value.

Obviously, however, the Room Utilization Rate will vary by academic program. For academic programs in which little specialized equipment is required and in which little nonscheduled activity is found (e.g., Area Studies, Business and Management, Computer and Information Sciences, Mathematics, and such Social Sciences as History, Philosophy, Economics, and Political Science) the RUR should approach 30 scheduled daytime hours per week. However, in programs in which a great deal of specialized equipment is used and in which the students are expected to use the facilities on a nonscheduled basis, it is not unusual to find that RUR of less than 20 hours per week is the highest that can be achieved, even at the lower division level (e.g., Architecture, Landscape Architecture, Planning, Fine Arts, Foreign Languages, Library Science).

►Station Occupancy Ratio (SOR)

Variations in the Station Occupancy Ratio are also primarily related to level of course. For lower division courses, the Station Counts of class laboratories are much less diverse than are the Station Counts of classrooms. In addition, class laboratory Section Sizes normally are tailored to the capacities of specific laboratories. As a result, there is generally a uniformly high correlation between Section Size and Station Count for class laboratories at the lower division level.

Generally, at the upper division level each class laboratory serves very few Sections of one or two courses. Yearly enrollment variations cause the Station Occupancy Ratio to be high one year and low the next for these more specialized facilities. On the average, the SOR will be significantly lower for upper-division courses than for lower-division courses.

The SOR for lower-division class laboratories should be in the range of 0.75 to 0.85, and the the SOR for upper-division class laboratories should be in the range of 0.55 to 0.65.

Because of the extremely large number of possible combinations of values of the three elements combined in the Assignable Square Feet per Weekly Student Hour (ASF/WSH) factor, no ranges for the overall factor are recommended.

COMMENTS

Class laboratories have a variety of uses in addition to those associated with degree program instructional activities (e.g., public service program short courses, student and faculty research, and experimental demonstrations). Generally, however, such activities can be accommodated in the unscheduled hours if the Average Room Utilization Rates (AvRUR) do not exceed the criteria suggested above.

Allowances for service areas, such as preparation rooms and storage rooms for chemicals and laboratory apparatus, are included in the floor area factors.

Section 3.1.3

Systemwide Facilities Planning Criteria

SPACE CATEGORY 3: RESEARCH AND GRADUATE TRAINING FACILITIES

(Nonclass Laboratories)

SUGGESTED FORM OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

- ►Assignable Square Feet (ASF) per faculty member engaged in research
- ►Assignable Square Feet (ASF) per head-count graduate student engaged in research

RATIONALE

The faculty requirements for research and graduate training are generated in large measure by the equipment necessary to the operation of such programs. However, because it is impractical to attempt to project facilities requirements on the basis of an undefined future complement of equipment, it is necessary to employ a substitute basis for projection.

The number of faculty members and graduate students involved in research have been selected as the most appropriate basis for a systemwide facilities planning criterion. Since faculty members and graduate students are the users of the equipment, there are definite relationships between the amount of equipment and the numbers of faculty members and graduate students. More importantly, it is much more practical to project number of faculty members and graduate students engaged in research than to project information concerning the equipment that these individuals will use.

It should be specifically noted that this systemwide facilities planning criterion is based on *number* of faculty members and graduate students *engaged in research,* rather than Full-Time Equivalents of faculty members and graduate students engaged in research, This particular form reflects the belief that it is the fact of involvement in research activities rather than the extent of this involvement which generates the need for facilities. An experiment requires the same amount of space whether the faculty member devotes one-quarter or three-quarters of his time to its operation. This particular form of the systemwide facilities planning criterion represents a significant departure from those approaches which historically have been used.

APPLICATION OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

The requirements for research and graduate training facilities vary significantly among academic programs. These variations must, therefore, be reflected in the factors used. Suggested values for Assignable Square Feet per person (faculty or graduate students) involved in research are presented in Table 3. Implicit in this criterion is the fact that a substantial amount of this type of space is required to permit a faculty member to initiate a research project. Once this initial amount of space has been provided, a limited number of graduate students can be accommodated in that space. However, for each additional graduate student an incremental amount of space is required.

TABLE 3

GENERAL PLANNING CRITERIA FOR RESEARCH SPACE

Academic Program	Assignable Square Feet* per Faculty Member Engaged in Research	Head-Count Graduate Students Accommodated in the Assignable Square Feet Provided for Each Faculty Member	Additional Assignable Square Feet per Additional Graduate Student Engaged in Research
Agriculture and Natural Resources Engineering Biological Sciences Physical Sciences	900-1,300	4	200-250
Architecture and Environmental Design Fine and Applied Arts Home Economics Psychology Communications	600-900	4	150-200
Education Area Studies Business and Management Computer and Information Sciences Foreign Languages Letters Library Science Mathematics Public Affairs and Services Law Theology	150-200	4	20-25

*Includes service space.

COMMENTS

The application of these criteria produces total research space requirements. This research space, however, need not be necessarily in the form of nonclass laboratories. For many academic programs (e.g., letters and social sciences) the requirement may be for additional office space. Although the calculation was couched in terms of nonclass laboratories, there is absolutely no reason for restricting research and graduate training activities to a single room type classification. Augmentation of office facilities is often a logical consequence. The result may be a situation in which evaluation of the office and nonclass laboratory room types is misleading. In all cases it is appropriate to combine the projected needs for office and research space and to compare this with the available Assignable Square Feet in offices and nonclass laboratories.

The term faculty member is meant to exclude teaching assistants and other types of graduate assistants (those numbers are accounted for in the graduate student category). Individuals engaged in postdoctoral research should be treated as if they were faculty members.

Section 3.1.4

Systemwide Facilities Planning Criteria

SPACE CATEGORY 4: OFFICE AND CONFERENCE FACILITIES

SUGGESTED FORM OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

►Assignable Square Feet (ASF) per Full-Time Equivalent (FTE) staff requiring office space

RATIONALE

The requirements for office and conference room facilities are determined almost entirely by the number of individuals to be provided with office space. It is possible to establish office and conference space requirements by calculating the amount needed by a selected subgroup of the staff (e.g., faculty and nonacademic professionals) and imputing from this figure the amount required by all other staff. However, this practice carries with it an implied assumption about the institution's staffing patterns and the ratios between numbers of employees of different categories (e.g., the ratio of faculty to secretarial and clerical employees). Since variations in such ratios should be expected from institution to institution, it is recommended that total numbers of staff requiring office space be determined for each institution and the general planning criterion applied to this figure.

This approach has an added benefit in that it focuses attention on decisions concerning the categories of staff to be provided with office space and on the staffing policies of each institution.

APPLICATION OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

The systemwide facilities planning criterion for office and conference facilities has been developed to avoid the question of which employees or groups of individuals are entitled to office space. This is a policy decision which must be made before the facilities planning process is begun. It should be noted specifically that this criterion is designed to be applied to those employees requiring office space in *all* programs and organizational units of the institution.

The quantitative values of the systemwide facilities planning criterion vary by type of institution (university vs. four-year vs. two-year) and by organizational unit within the institution. In general the office space requirements per person in nonacademic departments are greater than those in academic departments because of greater requirements for file storage, waiting rooms, other office service areas, and conference facilities. The office and conference space requirements per person in nonacademic departments are approximately the same for all types of institutions.

The values of the systemwide facilities planning criterion for academic departments, however, do vary by type of institution. The more complex the institution and the more varied the faculty members' activities, generally, the greater the requirements for office space. As a result, the per-person requirements are greatest for universities, somewhat less for four-year institutions, and least for two-year institutions.

It is suggested that the values of the systemwide facilities planning criterion for office and conference facilities presented in Table 4 are reasonable.

TABLE 4

SYSTEMWIDE FACILITIES PLANNING CRITERIA FOR OFFICE AND CONFERENCE FACILITIES*

(1)	(2)	(3)
Organizational Unit	Type of Institution	Assignable Square Feet per Full-Time Equivalent Staff Requiring Office Space
Academic Units	University Four-year Two-year	140-170 ASF/FTE Staff 125-150 ASF/FTE Staff 110-130 ASF/FTE Staff
Nonacademic Units	All institutions	140-170 ASF/FTE Staff

*These values include allowances for office, office service, conference room, and conference room service types of facilities.

COMMENTS

This system does not provide differential values of the criterion for different groups of employees. Although faculty and professional staff usually are given larger offices and generate the requirements for conference room space, the other groups of employees create the demand for most office service facilities. The overall factors thus tend to even out.

Office requirements for faculty members who engage in nonlaboratory research (historians, linguists, and economists, for example) are the sum of an office space and a research space requirement. Their offices consist of a module which has been generated by their office needs and a module generated by their nonlaboratory research needs. For inventory purposes these spaces, though consisting of two separately generated components, usually are counted as offices. The federal inventory scheme does allow for a proration of such space by function and the two components can therefore be treated separately if this is considered desirable.

Section 3.1.5

Systemwide Facilities Planning Criteria

SPACE CATEGORY 5: STUDY FACILITIES

SUGGESTED FORM OF THE SYSTEMWIDE FACILITIES PLANNING CRITERIA

►Stack Space: Assignable Square Feet (ASF) per bound volume
►Study (Seating) Space: Assignable Square Feet per Station (ASF/N)
►Library Service Processing Space: Percentage of stack space plus study space

RATIONALE

Historically, generalized planning for library facilities has been based on a combination of the three criteria listed above. The general form of these criteria is widely accepted and, for all intents and purposes, undisputed. Therefore, there seem to be no compelling reasons for developing new and radically different approaches.

More positively, these criteria do treat the three primary generators of library space requirements (books, users, and library processing) in a comprehensive manner, further justifying their continued use.

The proposed format for study facilities planning criteria contains one very significant deviation from the usual historical approach. Contrary to past practice, it is recommended that office space requirements in the library be calculated in accordance with the procedures suggested for office facilities in other organizational units (i.e., on the basis of Assignable Square Feet per Full-Time Equivalent staff requiring office space). This approach reflects the categorizations of space contained in the *Higher Education Facilities Classification and Inventory Procedures Manual* in that the work space which houses activities such as acquisitions, cataloging, and reader services is considered office space and is treated accordingly. In accordance with this definition service space includes only such things as card catalogs and circulation desks. The percentage of study and stack space devoted to service space defined in this more limited way is therefore much smaller than the values historically used (i.e., 5 percent versus the 20-25 percent historical value).

APPLICATION OF THE SYSTEMWIDE FACILITIES PLANNING CRITERIA

►Stack Space

Values for this factor almost universally range from 0.0833 to 0.10 Assignable Square Foot per volume. If "volume" is arbitrarily defined as a *bound* volume, the single value of 0.10 ASF per volume is appropriate. Those institutions which have succeeded in achieving a value less than 0.10 ASF/volume have done so by calculating the number of "equivalent" volumes for such things as newspapers, microfilm, and maps. However, the calculation of volume equivalents is so complex as to be inappropriate as a required step in a generalized planning system. Therefore, it is suggested that a planning criterion of 0.10 ASF per *bound* volume be used with the recognition that use of this factor carries with it an implied assumption concerning the mix of library resources.

►Study (Seating) Space

A value of 25 to 35 Assignable Square Feet per Station (ASF/N) for library study space is appropriate for most institutions. However, a higher value for library study space may be required in those instances where private study cubicles are provided for faculty and/or graduate students.

The number of Stations to be provided is determined on the basis of a policy decision. It should be recognized, however, that institutions are not entirely free to determine the number of Stations to be provided. In some cases accrediting agencies require that a minimum proportion of the FTE students be provided library Stations (often 25 percent). The requirements for a law library are such that a Station for each student may be required.

►Library Services Processing Space

It is recommended that a value of 5 percent of the sum of the stack area and study area be used as the basis for calculating library service space. As was noted previously, library office space requirements should be calculated independently and should not be included within the category of library processing space.

If library office space is not calculated separately, then the sum of the office and other library processing areas will range from 20 percent (for large libraries) to 25 percent (for smaller libraries) of the total amount of space in the study and stack categories.

COMMENTS

Institutions frequently are locating a larger proportion of their study space outside of the library building (e.g., 15 percent of the student body may be seated in the library and an additional 10 percent elsewhere on campus). It should be noted, however, that nonlibrary study space cannot be viewed as a substitute for library user facilities.

As a result, the criterion for seating space should be viewed in an institutionwide context which gives recognition to all institutional programs and functions. Furthermore, some of the space required to house the research function may be provided through the addition of library carrels.

Section 3.1.6

Systemwide Facilities Planning Criteria

SPACE CATEGORY 6: SPECIAL USE, GENERAL USE, AND SUPPORT FACILITIES

ROOM TYPES

- Special Use: armory, athletic-physical education, audio/visual, clinic (nonmedical), demonstration, and field-service facilities
- General Use: assembly, exhibition, food, health (student), lounge, merchandising, and recreation facilities
- Support: central food store, central laundry facilities, data processing and computer, shop, storage, and vehicle storage

SUGGESTED FORM OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

- Percent of the total space contained in categories one through five*

RATIONALE

Within this category are a large number of different types of space. No single one of these space types can be related firmly to a readily measureable variable within the institution. Rather, the amount of these space types available or required by an institution is determined by the institution's philosophies, organizational structure, operating style, governing board policies, and financial capabilities. In addition, there are certain substitution effects evident among these space categories. For example, lounge and recreation space may be reduced in order to acquire more athletic facilities or additional assembly facilities.

With regard to any single space type in this category, comparison of inventory data from various sources confirms that there is a great deal of variation from institution to institution. However, these same comparisons reveal that there is relatively little variation from institution to institution when these three space types are considered as a single category. It is suggested, therefore, that this phenomenon be recognized and used to advantage in developing a criterion for these types of space.

This approach has the added benefit of promoting institutional individuality, initiative, and style while also maintaining control over total facilities resources requirements.

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*Space categories one through five of this document include all room type codes 100 through 400 in the *Higher Education Facilities Classification and Inventory Procedures Manual.*

APPLICATION OF THE SYSTEMWIDE FACILITIES PLANNING CRITERION

It is suggested that a value of 40 percent to 65 percent of the total amount of space in categories one through five (room type codes 100 through 400) is appropriate for his particular criterion.*

The exact value for a specific institution is largely dependent on the size of the institution.† In general, the smaller institutions require that a higher percentage of their space be devoted to these kinds of facilities than do the larger institutions. This stems simply from economies of scale. There are usually efficiencies in larger scale operations since many activities (such as most indoor physical education activities) require standard amounts of space regardless of the size of the institution.

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*The suggested range of values is based on facilities inventory data reported to the National Center for Educational Statistics and to several state agencies.

†Variation in this factor by size of institution is also supported by empirical evidence in facilities inventories.

Section 3.2.

SYSTEMWIDE FACILITIES PLANNING CRITERIA

SUMMARY

DISCUSSION

The material presented in this section represents an attempt to define a system of generalized planning criteria which is appropriate at a systemwide or statewide level. These criteria also are appropriate for limited rule-of-thumb type institutional applications. Within this proposed system all types of space for which requirements can be evaluated on a comparable basis are treated.

The notable omissions from this system are medical care facilities, residential facilities, and associated food service facilities. The requirements for these types of facilities vary in the extreme from one institution to the next. Moreover, medical facilities generally house "super" research operations and in every instance require special treatment. Generally, the number of students who must be housed and fed is determined by factors which are partially beyond institutional control. Particular requirements are determined largely by the institution's location and the ability of the surrounding community to provide an alternative source for these services. Institutions located in large cities may be required to provide few, if any, supporting services. On the other hand, institutions situated in isolated, rural areas may have to provide the full range of services to the entire student body and, to some extent, to residents of the community as well.

Historically, facilities which house auxiliary enterprise operations have been excluded from statewide or systemwide facilities planning and evaluation efforts. This has occurred because the revenue-financed nature of these operations has allowed them to be administered relatively independently. However, the ability to finance the construction of these facilities solely on the basis of revenue received from their operation is decreasing. More and more they are being considered as an integral part of the institution's physical plant and are competing for capital funds on the same basis as other types of facilities. The ability of an institution to attract sufficient students to meet its projected enrollment growth may well be determined by that institution's ability to provide certain basic services. As a result, planning for such facilities should be an integral part of the facilities planning process at the institutional level. Regular evaluation of such facilities at the state level on the same basis as the evaluation appropriate for other types of facilities is probably unwarranted. Involvement of state-level agencies in the decision-making processes related to construction of such facilities, however, is warranted. While these facilities purposely are not included in the proposed system, their influence and importance should not be overlooked.

DATA REQUIREMENTS

One of the objectives of any system of generalized planning criteria should be that it produce the desired results using a minimum of readily available, uniformly defined lata. The following list is a summary of the basic data required as inputs to the system described on the previous pages.

- ►Full-Time Equivalent Students
- ►Weekly Student Hours of classroom instruction
- ►Weekly Student Hours of laboratory instruction (by department and course level)
- ►Number of faculty members engaged in research (by department)
- ►Number of graduate students engaged in research (by department)
- ►FTE staff requiring office space (by department)
- ►Number of bound volumes in the library
- ►Number of library user Stations to be provided
- ►Facilities inventory data

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

MANUAL SEVEN

REFERENCE GUIDE

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Technical Report 17-7

Planning and Management Systems Division
Western Interstate Commission for Higher Education
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GLOSSARY

Academic Department — For purposes of these manuals, the term is used to denote those organizational units of an institution of higher education which implement a special subset of the Instruction, Research, and Public Service programs of that institution. Vocational-technical units are included also. The term is used in the broad sense of any academic organizational unit and is used to distinguish these organizational units from administrative departments. (See Administrative Department.)

Academic Support Program — A support program within the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of those program elements which directly support the academic functions of the institution (e.g., libraries, computer services, and audio/visual services).

Administrative Department — For purposes of these manuals, the term is used to denote those organization units of an institution of higher education which provide student services and institutional support services to the academic departments or to those individuals being served by the academic departments. (See Academic Department.) The organizational units which house the Academic Support, Student Service, and Institutional Support programs of an institution. Nonacademic departments.

Alteration or Conversion Space — Rooms or other assignable floor areas which are temporarily out of use because they are being altered, converted, or rehabilitated at the time of the facilities inventory census date.

Armory Facility — A room or area used by Reserve Officers' Training Corps (ROTC) units.

This category includes indoor drill areas, rifle ranges, and special-purpose military science rooms.

Armory Facility Service Space — A room which directly serves an armory facility as an extension of the activities of such a facility.

This category includes supply rooms, weapons rooms, etc.

Assembly Facility — A room designed and equipped for the assembly of large numbers of people for such things as dramatic, musical, devotional, livestock judging, or commencement activities.

This category includes rooms generally referred to as theaters, auditoriums, concert halls, arenas, chapels, and (livestock) judging pavilions. Seating area, stage, orchestra pit, chancel, arena, and aisles are included in assembly facilities.

Assembly Facility Service Space — A room which directly serves an assembly facility as an extension of the activities of such a facility.

This category includes check rooms, coat rooms, ticket booths, dressing rooms, projection booths, property storage, make-up rooms, costume storage, green rooms, and control rooms.

Assignable Square Feet — The sum of all areas on all floors of a building assigned to or available for assignment to an occupant, including every type of space functionally usable by an occupant (excepting Custodial Area, Circulation Area, and Mechanical Area).

For a single room, the sum of all areas located between the principal surface of the walls and partitions at or near floor level. Space occupied by alcoves, closets, and built-in shelves opening into and serving the room ordinarily should be included. Areas of columns, door-swings, and impaired headroom, and space occupied by heating devices may be ignored. If, however, any of these structural features constitutes a large loss of usable space, the area should be deducted from the square feet measurement of the room.

Athletic/Physical Education Facility — A room (or area) used by students, staff, or the public for athletic activities.

Included in this category are rooms generally referred to as gymnasiums, basketball courts, handball courts, squash courts, wrestling rooms, swimming pools, ice rinks, indoor tracks, indoor "fields," and field houses.

Athletic/Physical Education Facility Service Space — A room which directly serves an athletic/physical education facility as an extension of the activities in such a facility.

Included in this category are rooms generally referred to as locker rooms, shower rooms, coaches' rooms, ticket booths, dressing rooms, equipment supply rooms, first aid rooms, skate sharpening rooms, towel rooms, etc.

Athletic Facility Spectator Seating — The seating area used by students, staff, or the public to watch athletic events.

Included in this category are permanent seating areas in field houses, gymnasiums, and natatoriums.

Audio/Visual, Radio, Television Facility — A room or group of rooms used in the production and distribution of instructional materials and the operation of equipment for the communication of instructional materials.

This category includes rooms generally referred to as television studios, radio studios, sound studios, graphics studios, and similar rooms.

Audio/Visual, Radio, Television Facility Service Space — A room which directly serves an audio/visual, radio, or television facility as an extension of the activities in such a facility.

Included in this category are rooms generally referred to as film libraries, tape libraries, control rooms, video tape recorder rooms, property storage, recording rooms, and engineering maintenance rooms.

Average Duration of Patient Confinement — The average duration of the hospital stay of individuals admitted as in-patients. The average duration of patient confinement is calculated by dividing the total number of patient bed days for the year by the number of in-patients admitted during the year.

Average Room Utilization Rate (AvRUR) — The average number of hours per week a group of rooms is scheduled for use.

$$\text{AvRUR} = \frac{(\text{Scheduled Weekly Room Hours})}{(\text{Number of Rooms})}$$

AvRUR includes only *scheduled* Weekly Room Hours (WRH). Other uses are included under Imputed Room Utilization Rate (IRUR).

As a matter of convention, Average Room Utilization Rate (AvRUR) is used with respect to the total number of classrooms (or class laboratories) in an institution (or for some aggregation of rooms with different Station Counts or of different types).

Average Section Size (AvSS) — The average number of students in a group of class sections. For the purposes of these manuals, the Average Section Size is derived by dividing the total Weekly Student Hours (WSH) taught in a group of rooms by the total Weekly Room Hours (WRH).

$$\text{AvSS} = \frac{(\text{Total Weekly Student Hours})}{(\text{Total Weekly Room Hours})}$$

$$\text{AvSS} = \frac{(\text{WSH})}{(\text{WRH})}$$

Average Station Occupancy Ratio (AvSOR) — The average proportion of Stations used when a group of rooms is scheduled for use.

As a matter of convention, Average Station Occupancy Ratio (AvSOR) is used with respect to the total number of classrooms (or class laboratories) in an institution (or for some aggregation of rooms with different Station Counts or of different types).

$$\text{AvSOR} = \frac{(\text{Scheduled Weekly Student Hours per Station})}{(\text{Scheduled Weekly Room Hours per Room})}$$

Average Station Utilization Rate (AvSUR) — The average number of hours per week the total number of Stations in a group of rooms is scheduled.

As a matter of convention, Average Station Utilization Rate (AvSUR) is used with respect to the total number of classrooms (or class laboratories) in an institution (or for some aggregation of rooms with different Station Counts or of different types).

$$\text{AvSUR} = \frac{(\text{Scheduled Weekly Student Hours})}{(\text{Number of Stations})}$$

also

$$\begin{aligned}\text{AvSUR} &= (\text{Average Room Utilization Rate}) \times (\text{Average Station Occupancy Ratio}) \\ &= (\text{AvRUR}) \times (\text{AvSOR})\end{aligned}$$

Board Policies — The policies of an institution which specify those groups of students who are required to sign contracts which obligate them to take their meals in an institution-owned dining facility. These policies also normally state the particular dining facilities which will be used to accommodate particular groups of students (e.g., residents of specific residence halls, etc.).

Building — One type of facility. For the purposes of these manuals, an enclosed structure having at least a floor, walls, and a roof.

Building Programming — The process by which that information is developed which concerns a proposed construction or renovation project and which is required as a prerequisite to the development of detailed design plans for the project. The required information normally consists of such things as detailed listings of the amounts of each type of space, basic design requirements, the functional relationships between the various program components and space units, site for the building, basic guidelines for building configuration and relationships to site, utility requirements of the various space units, preliminary cost constraints, and a timetable.

Calculated Capacity of a Dining Facility — The number of diners that can be accommodated in a dining facility for any particular meal. Capacity is calculated by multiplying the designed seating capacity of the facility by the number of turnovers appropriate for the meal in question. (See Turnover.)

Capital Development Program — The specification of priorities for projects identified within the Facilities Development Program and the creation of a preliminary plan for acquiring the financial resources necessary to the implementation of the Facilities Development Program. The timetable and financing plan for facilities construction projects, usually over an extended time period.

Central Food Stores Facility — A central facility for the processing and storage of foods used in residence facilities and food service facilities.

This category includes food storage areas, lockers, cold rooms, refrigerators, meat processing areas, and similar facilities located in a central food stores building.

Central Laundry Facility — A central facility for washing, drying, and ironing of linens, uniforms, and other institutional material.

Circulation Area — That portion of the gross area which is required for physical access to some subdivision of space (e.g., lobbies, corridors, stairs, elevator shafts).

Class Laboratory Capacity — The number of Weekly Room Hours (WRH) and Weekly Student Hours (WSH) which can be accommodated in an institution's class laboratory facilities.

Class Laboratory Facility — A room used by regularly scheduled classes which require special-purpose equipment for student participation, experimentation, observation, or practice in a field of study.

A Class Laboratory Facility is designed for and furnished with specialized equipment to serve the needs of a particular area of study for group instruction in regularly scheduled classes. The design and/or equipment in such a room normally precludes its use for other areas of study.

Included in this category are rooms generally referred to as teaching laboratories, instructional shops, typing laboratories, drafting rooms, band rooms, choral rooms, (group) music practice rooms, language laboratories, (group) studios, and similar specially designed and/or equipped rooms if they are used primarily for group instruction in regularly scheduled classes.

Class Laboratory Facility Service Space — A room which directly serves a class laboratory facility as an extension of the activities of such a facility.

Included in this category are balance rooms, cold rooms, stock rooms, dark rooms, equipment issue rooms, animal rooms, greenhouses, and similar facilities which serve class laboratory facilities.

Class Laboratory Hour of Instruction — One hour spent by one instructional staff member in contact with a scheduled class laboratory Section. Also referred to as a class laboratory Faculty Contact Hour. (Note that these manuals do *not* use the traditional term "contact hour" for the measurement of *student* time; these manuals use the term "Weekly Student Hours.")

Classroom Capacity — The number of Weekly Room Hours and Weekly Student Hours which an institution's classrooms can accommodate.

Classroom Facility — A room used by classes which do not require special-purpose equipment for student use.

Included in this category are rooms generally referred to as lecture rooms, lecture-demonstration rooms, seminar rooms, and general purpose classrooms. A classroom facility may be equipped with tablet arm chairs (fixed to the floor, joined together in groups, or flexible in arrangement), tables and chairs (as in a seminar room), or similar types of seating. A classroom facility may be furnished with special equipment appropriate to a specific area of study if this equipment does not render the room unsuitable for use by classes in other areas of study.

Classroom Facility Service Space — A room which directly serves a classroom facility as an extension of the activities in such a facility.

Included in this category are projection rooms, cloak rooms, preparation rooms, closets, and storage if they serve classroom facilities.

Classroom Hour of Instruction — One hour spent by one instructional staff member in contact with a scheduled classroom course or Section. Also referred to as a classroom Faculty Contact Hour. (Note that these manuals do *not* use the traditional term "contact hour" for the measurement of *student* time; these manuals use the term "Weekly Student Hours.")

Classroom Type — A term for a subdivision within the room type "Classroom." These subdivisions are designed to allow institutions to differentiate between such Classroom Types as lecture halls, general purpose classrooms, and seminar rooms.

Clerical Rank — The categorization of clerical positions as a function of a number of variables such as responsibility, skill level, and length of service.

Clerical Staffing Policy — The institutional policy stating the level of secretarial and clerical support to be provided to faculty or other personnel. In its most common form a clerical staffing policy states a ratio of Full-Time Equivalent faculty to Full-Time Equivalent clerical employee(s).

Clinic Facility — A room used for diagnosis and/or treatment of patients in a program other than medicine (human or veterinary), dentistry, and student health care.

Included in this category are rooms generally referred to as patient examination rooms, testing rooms, consultation rooms. Clinics are typically associated with such educational areas as psychology, speech and hearing, remedial reading, and remedial writing.

Clinic Facility Service Space (Nonmedical) — A room which directly serves a clinic facility as an extension of the activities in such a facility.

Included in the category are waiting rooms, observation rooms, control rooms, records rooms, and similar supporting rooms.

Comprehensive Plan — A statement of institutional goals and objectives of the expected nature and timing of institutional development and of the estimated manpower, fiscal, and facilities resources required to attain the stated institutional goals and objectives over a specified period of time (e.g., five, ten, or twenty years).

Conference Facility — A room used primarily for meetings other than scheduled classroom activities.

A conference facility may be equipped with tables and chairs, lounge-type furniture, straightback chairs, and/or tablet arm chairs. It typically (but not necessarily) is assigned to a department for its use. It is distinguished from such classroom facilities as seminar rooms, lecture rooms, and general classrooms because it is used primarily for activities other than scheduled classes.

Conference Facility Service Space — A room which directly serves a conference facility as an extension of the activities in such a facility.

Included in this category are such rooms as kitchenettes, chair storage rooms, projection rooms, and sound equipment rooms.

Construction Area — That portion of the gross area of a building which cannot be put to use because of the presence of structural features of the building. Areas of a building which cannot be assigned for use because they are necessary to the structure of the building. Such areas include walls, pipe tunnels and chases, elevator shafts, columns, and other structural elements.

Contract Board Students — For the purposes of these manuals, students who, by contract, agree to pay a specified charge for the provision of a certain number of meals during a specified period of time (usually a quarter or semester).

Course — An organized set of activities pertaining to instruction in a particular subject matter, which are conducted during a given period of time (usually a quarter or semester) and for which credit toward graduation or certification is usually given (AACRAO definition).

Course Characteristics — Description of a course which indicates the instructional techniques, the course credit hours, and the space and time requirements for the course.

Course Credit Hours — The amount of credit offered for a course. The numerical credit value awarded for completion of a course, usually described in semester, quarter term, or other units of credit toward a degree or certificate.

Course Credit Hours Attributable to "Other" Instruction — The amount of credit offered for those activities required for the completion of a course which do not occur as formally scheduled classroom or class laboratory activities. For example, credit attributable to such things as independent study, thesis work, field trips, etc.

Course Enrollment — One student enrolled in one course or one Section of a course. One student may often account for multiple course enrollments. Also referred to as a course registration.

Course Identifier — A number or other code which serves uniquely to identify a course.

Course Level — The categorization by institutional standards for the level of offering of a specific course. The level of student to which a course is directed primarily but not exclusively. See NCHEMS (WICHE-PMS) *Data Elements Dictionary: Course* for relevant categories.

Current List of Course Offerings — See Schedule of Courses.

Custodial Area — The sum of all areas on all floors of a building used for building protection, care, maintenance, and operation. Includes areas such as custodial locker rooms, janitors' closets, and maintenance storerooms.

Data Processing and Computing Facility — A room (or group of rooms) for institutionwide processing of data by machines or computers.

This category includes keypunch rooms, electronic data processing rooms, electronic computer rooms, and similar data processing areas.

Data Processing and Computing Facility Service Space — A room which directly serves a data processing and computing facility as an extension of the activities in such a facility.

This category includes such rooms as card storage, paper form storage, tape storage, tape storage vaults, control rooms, plugboard storage, wiring rooms, equipment repair rooms, observation rooms, and similar service areas.

Degree of Privacy — An expression of the number of occupants assigned to an enclosed office; degree of privacy in these manuals is expressed in terms of single, double, or multiple occupancy.

Demonstration Facility — A room (or group of rooms) used to practice the principles of certain subject matter areas, such as teaching and home management.

This category includes demonstration schools, laboratory schools, preschool nurseries, etc., if the facilities support the training of the college-level students involved as (certified) teachers. This category includes home management houses which serve to train college-level students in home management.

Demonstration Facility Service Space — A room which directly serves a demonstration facility as an extension of the activities in such a facility.

Included in this category are facilities generally referred to as store rooms, laundries, etc. (in a home demonstration facility) and kitchens, lockers, and shower rooms (in a laboratory school).

Dental Clinic Facility — A room used for the dental examination and/or dental treatment of humans.

Dental Clinic Facility Service Space — A room which serves a dental clinic facility as a direct extension of the activities in such a facility.

This category includes supporting dental laboratory services and other facilities which serve a dental clinic.

Department — As used in these manuals, the basic organizational unit of a college or university. Includes both the academic and administrative organizational units. (See Academic Department and Administrative Department.)

Department Size — The number of head count or Full-Time Equivalent staff requiring work Stations.

Departmental Integrity — The assignment of the staff members of a single department to office facilities in reasonably close physical proximity.

Design Capacity — The number of individuals which a facility is designed to accommodate at one time. The number of individuals a facility can accommodate when used in the manner originally intended.

Design Development — The process by which the general requirements of a building, as expressed in the building program, are translated into a detailed set of architectural plans. The output of the process is a detailed set of working drawings and specifications for construction of a building.

Designed Seating Capacity — The number of Stations a room is designed to accommodate.

Engaged in Research — For the purposes of these manuals, the state of participating in investigative and scholarly activities which are intended to produce new knowledge and which are recognized by the institution in the form of funding or released time or other work load reduction.

Enrollment — See Course Enrollment.

Examination/Consultation Rooms — For the purposes of these manuals, rooms in infirmaries or health facilities which are used for investigation of health complaints or disorders. Rooms used for private discussion and investiga-

Exhibition Facility — A room used for exhibits.
tion of health complaints.

This category includes museums, art galleries, and similar exhibition areas.

Study collections not primarily for general exhibition such as departmental displays of anthropological, botanical, or geological specimens should be classified under an appropriate laboratory facility category. (See Class Laboratory Facility, Special Class Laboratory Facility, Individual Study Laboratory Facility, and Nonclass Laboratory Facility.)

Exhibition Facility Service Space — A room which directly serves an exhibition facility as an extension of the activities in such a facility.

This category includes work rooms for the preparation of materials and displays, vault or other storage for works of art, and check rooms.

Facilities Development Program — The outcomes of the process which converts projected space requirements into identifiable building units. A listing of the additional buildings required to house the institution's proposed programs with associated informaton concerning the departments scheduled to occupy the buildings and general information about the types of space to be contained within.

Facilities Inventory — A tabulation of all physical facilities of the institution. When done in accordance with federal guidelines, the facilities are classified by type of space, organizational unit, discipline division or specialty, and function.

Facilities Planning — The process by which the amount of facilities resources required by an institution's programs are estimated. In general, the outputs of the facilities planning procedures which are required for development of a comprehensive plan are the projected amounts of each type of space needed to house the activities of each department or organizational unit within an institution.

Facility — For the purposes of these manuals, any physical structure required by the institution for the performance of its programs and related activities. Included are parking areas, outdoor playing areas, buildings, parks, rooms, service areas, agricultural fields, and landscaped areas.

Faculty — An individual or group of individuals appointed to a teaching position or positions at a college or university and having a rank of Lecturer or Instructor or higher. Includes those individuals appointed to research and public positions of equivalent level (e.g., Senior Research Scientist, Research Associate). Teaching assistants are excluded from this category, but are included under "Instructional Staff." Adjunct personnel, however, are included.

Faculty Contact Hour — One hour spent by one instructional staff member in contact with a scheduled Section. (Note that these manuals do *not* use the traditional term "contact hour" for the measurement of *student* time; these manuals use the term "Weekly Student Hours.")

Faculty Load — The average assigned instructional load per instructional staff member, usually expressed in terms of Weekly Faculty Contact Hours or Student Credit Hours of classes taught per Full-Time Equivalent instructional staff member. For purposes of the *Higher Education Facilities Planning and Management Manuals,* this is an institutionally defined variable.

Faculty Rank — The categorization of faculty position as a function of a number of variables such as responsibility, length of service, academic expertise. (See NCHEMS (WICHE-PMS) *Higher Education Faculty and Staff Assignment Classification Manual.*)

Field-Service Facility — A barn or similar structure for animal shelter or the handling, storage, and/or protection of farm products, supplies, tools, and field experiments.

Field-service facilities include barns, animal shelters, sheds, silos, feed units, hay storage, and seedhouses. Greenhouses related to farm operations are included in this category. Structures are typically of light frame construction with unfinished interiors, usually but not exclusively related to agricultural field operations and are frequently located outside the central campus area. Also included are such things as meteorological field test stations.

Food Facility — A room used for eating food.

This category includes dining halls, cafeterias, snack bars, restaurants, and similar eating areas.

Food Facility Service Space — A room which directly serves a food facility as an extension of the activities in such a facility as storage, preparation, serving, and cleanup.

This category includes areas such as kitchens, refrigeration rooms, freezers, dishwashing rooms, cafeteria serving areas, and other nondining areas.

Food Service in Residence Halls — Those facilities where food is prepared and served to the occupants of residence halls.

This category includes all dining halls, kitchens, and food service facilities in residence halls for unmarried persons.

Free-Time Recreational Activities — Recreational activities which are neither scheduled nor formally organized. As used in the *Higher Education Facilities Planning and Management Manuals,* the category of free-time recreational activities is one of the four categories of activities commonly conducted in Athletic/Physical Education Facilities. (See Intramural Athletics, Intercollegiate Athletics, and Physical Education Classes.)

Freshman — A student in the first year of work at an institution of higher education.

Full-Time — For the purposes of these manuals, the interpretation of what amount of activity or load constitutes a full-time commitment to work or study within the organized programs of the institution. (See Part-Time.)

Full-Time Equivalent (FTE) — The equivalent of one person who is deemed to be carrying a full load or having a full-time appointment in institutionally agreed upon convention for converting numbers of specific individuals (students or employees) to an equivalent number of full-time persons.

General Planning Criteria — Space or estimation guides which are designed for use in calculating aggregate space needs.

Goals — Highly desirable conditions sought. Goals are stated in broad, qualitative terms and serve to identify specific functional areas of interest. The statement of goals represents the conceptual structure of future institutional development. (See Objectives.)

Graduate Assistant (Teaching) — An individual who is considered by the institution to be a graduate student and, in addition, is assigned to perform particular instructional activities. Includes the categories of Teaching Assistant and Associate where used.

Gross Area — Sum of the floor areas included within the outside faces of exterior walls for all stories or areas which have floor surfaces. (For a complete discussion, see the *Higher Education Facilities Classification and Inventory Procedures Manual.*)

Head-Count Faculty — Any individual considered by the institution to be a faculty member without regard to the work load being carried. Includes both full-time and part-time faculty members.

Head-Count Student — Any individual considered by the institution to be a student without regard to the course load being carried. Includes both full-time and part-time students.

Health Facility (Student) — A room for the medical examination or treatment of students.

This category includes examination rooms, bedrooms, surgery rooms, and clinics.

Health Facility Service Space (Student) — A room which directly serves a health facility (student) as an extension of the activities in such a facility.

Included in this category are such rooms as dispensaries, record rooms, waiting rooms, clinical laboratories, scrub-up rooms, and linen closets.

Higher Education General Information Survey (HEGIS) — The annual survey of college and university statistical data conducted by the United States Office of Education, National Center for Educational Statistics.

Human Hospital/Clinic Facility — A room used for medical examination and/or treatment of humans as in-patients or out-patients.

This category includes rooms generally referred to as examination rooms, operating rooms, x-ray rooms, physical therapy rooms, delivery rooms, labor rooms, recovery rooms, and similar facilities which are (or may be) used in the examination and/or treatment of several patients within the course of the day. It also includes such clinics as medical, surgical, obstetric-gynecology, pediatric, psychiatric, and ophthalmology. Physical and occupational therapy clinics associated with a hospital are also included.

Human Hospital/Clinic Facility Service Space — A room which serves a human hospital/clinic facility as a direct extension of the activities in such a facility.

This category includes rooms generally referred to as clinical laboratories, pharmacy, radium storage, control rooms, isotope vaults, animal rooms supporting diagnostic functions, and similar rooms which support clinical facilities, but which the patient does not normally enter.

Human Hospital/Patient Care Facility — A room which provides a bed for patients in a hospital.

This category includes rooms generally referred to as bedrooms, wards, nurseries, and similar rooms.

Human Hospital/Patient Care Facility Service Space — A room which serves a patient care facility as a direct extension of the activities in such a facility.

This category includes rooms generally referred to as nurses' stations, charting rooms, tub rooms, medication rooms, nourishment rooms, formula rooms, and food service facilities for patients.

Imputed Average Section Size (IAvSS) — The average number of persons occupying a room when the room is in use, either formally or informally. The quotient which results from dividing the Imputed Weekly Student Hours (IWSH) by the Imputed Weekly Room Hours (IWRH).

$$\text{IAvSS} = (\text{IWSH}) \div (\text{IWRH})$$

Imputed Room Utilization Rate (IRUR) — The number of hours per week a special class laboratory or an individual study laboratory is used both formally and informally.

Imputed Station Occupancy Ratio (ISOR) — The proportion of occupied Stations to available Stations when a special class laboratory or an individual study laboratory is used both formally and informally.

Imputed Station Utilization Rate (ISUR) — The number of hours per week the Stations in a special class laboratory or in an individual study laboratory are used both informally and formally. The product resulting from multiplying the Imputed Room Utilization Rate (IRUR) by the Imputed Station Occupancy Ratio (ISOR).

$$\text{ISUR} = (\text{IRUR}) \times (\text{ISOR})$$

Imputed Weekly Room Hour Capacity (IWRH$_c$) — The number of Imputed Weekly Room Hours (IWRH) that can be accommodated in rooms of each Station Count. The product of the number of Rooms (R) of each Station Count and the Imputed Room Utilization Rate (IRUR) assumed for planning purposes for that Station Count.

$$(\text{IWRH}_c) = (\text{R}) \times (\text{IRUR})$$

Imputed Weekly Room Hours (IWRH) — The sum of the scheduled Weekly Room Hours (WRH) and the number of informally scheduled hours of room use. The quotient resulting from dividing the Imputed Weekly Student Hours (IWSH) by the product resulting from multiplying the number of Stations (N) by the Imputed Station Occupancy Ratio (ISOR). Informally scheduled hours may be a matter of record or may be estimated.

$$\text{IWRH} = (\text{IWSH}) \div [(\text{N}) \times (\text{ISOR})]$$

Imputed Weekly Student Hour Capacity (IWSH$_c$) — The number of Imputed Weekly Student Hours (IWSH) that can be accommodated in Rooms of each Station Count. The product of the number of Stations (N) in Rooms of each Station Count and the Imputed Station Utilization Rate (ISUR) assumed for planning purposes for that Station Count.

$$\text{IWSH}_c = (\text{N}) \times (\text{ISUR})$$

Imputed Weekly Student Hours (IWSH) — The sum of any scheduled Weekly Student Hours (WSH) and the number of informally scheduled hours students are occupying the Stations in the room. Informally scheduled hours may be a matter of record or may be estimated. The product resulting from multiplying the number of Stations (N) by the Imputed Station Occupancy Ratio (ISOR) by the Imputed Weekly Room Hours (IWRH).

$$\text{IWSH} = (\text{N}) \times (\text{ISOR}) \times (\text{IWRH})$$

Inactive Space — Rooms or other assignable floor areas which are available for assignment, but which are unassigned at the time of the facilities inventory census date.

Independent Operations Program — A support program with the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of those program elements which are independent of, or unrelated to, the basic missions of the institution. These may include noninstitutional agencies housed by the institution or operations generating income for the institution that are not otherwise related to the purposes of the institution.

Indicators of Load — See Load Indicators.

Individual Study Laboratory Facility — A room especially equipped and/or designed for individual student experimentation, observation, or practice in a particular field of study. Included in this category are music practice rooms, individual study laboratories, and similar rooms which serve a particular subject-matter area.

Stations may be grouped (as in an individual study laboratory) or individualized (as in a music practice room).

Individual Study Laboratory Facility Service Space — A room which directly serves an individual study laboratory facility as an extension of the activities in such a facility.

Induced Course-Load Matrix (ICLM) — An array which describes the distribution of the average load placed on the various academic departments (disciplines) by students of various student levels and majors. Manual Six describes the way in which different levels of detail can be accommodated in an Induced Course-Load Matrix.

Infirmary — A building or group of rooms for the care of the sick or injured. A small hospital or dispensary.

In-Patient — A patient who is lodged and fed in a hospital or infirmary while undergoing treatment. (See Out-Patient.)

In-Patient Admission Rate — The average number of patients admitted to a hospital or infirmary for in-patient care over a specified period of time (usually a day or a year).

In-Patient Admissions — Individuals admitted to a hospital or infirmary for treatment as in-patients.

Institutional Support Program — A support program in the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of those activities within the institution which provide campuswide support to the other programs.

Instruction Program — A primary program in the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of all formal instructional activities in which a student engages to earn credit toward a degree or certificate.

Instruction Type — The categorization of the methods by which organized instruction is conducted which reflects educational technology and the use of the facilities, materials, and equipment. For purposes of these manuals, the primary types of instruction are classroom (which includes lecture, seminar, recitation/discussion), class laboratory, and other (which includes independent study, thesis, etc.).

Instructional Loads — The amount of instructional activity required of each academic department as a result of the instructional demands generated by the students' course choices. Usually expressed in terms of the total number of student course registrations or of Student Credit Hours to be taught by the department or in terms of the total number of Weekly Faculty Contact Hours required to meet the department's instructional commitments.

Instructional Staff — Those employees of an institution assigned to instructional activities. This category is subdivided into (1) Instructional Faculty and (2) Graduate Assistants (teaching) — or Teaching Assistants.

Instructional Staffing Policy — The institutional policy stating the instructional load considered (on the average) to be a full-time load for an instructional staff member. Instructional staffing policies are most commonly expressed in terms of Student Credit Hours per Full-Time Equivalent instructional staff member or Weekly Faculty Contact Hours per Full-Time Equivalent instructional staff member. Within an institution, instructional staffing policies may vary by department (discipline), course level, or type of instruction.

Intercollegiate Athletics — Formally organized athletic activities which involve competition of teams or individuals representing two or more colleges or universities, as used in the *Higher Education Facilities Planning and Management Manuals.* Intercollegiate athletics (the actual event as well as practice), therefore, is one of the four categories of activities commonly conducted in Athletic/Physical Education facilities. (See Intramural Athletics, Physical Education Classes, and Free-Time Recreational Activities.)

Intramural Athletics — Formally organized athletic activities which involve competition of teams and/or individuals who are students of the same institution. As used in the *Higher Education Facilities Planning and Management Manuals,* Intramural athletics is one of the four categories of activities commonly conducted in Athletic/Physical Education facilities. (See Intercollegiate Athletics, Physical Education Classes, and Free-Time Recreational Activities.)

Inventory — See Facilities Inventory.

Laboratory Type — A term for homogeneous groups of facilities within the room type "Class Laboratory" (e.g., organic chemistry labs, introductory physics labs, architecture design studios, etc.).

Length of Serving Period — The length of time a dining facility is scheduled for use in serving a meal.

Level of Course — See Course Level.

Level of Staff — See Staff Level.

Level of Student — See Student Level.

Library Processing Facility — A room which serves a study room, stack room, or open-stack reading room as a supporting service to such rooms (e.g., storage, central catalog, waiting area). In these manuals, office and work Station areas for library staff are treated separately for detailed analysis and projection, but may be part of library processing facilities.

Included in this category are areas generally referred to as card catalog, circulation desk, bookbinding, microfilm processing, and audio/visual record-playback equipment for distribution to individual study Stations.

Load Factor — See Load Indicators.

Load Indicators — Indices, pointers, or gauges which signify in quantitative terms the demand which is or would be generated by present or future activities in an institution. They may apply to staff work loads, facility occupancy loads, or student course and study loads.

Lounge Facility — A room used for rest and relaxation.

A lounge is typically equipped with upholstered furniture, draperies, and/or carpeting.

Lounge Facility Service Space — A room which directly serves a lounge facility, such as a kitchenette or cloak room.

Major — The degree program in which the student is enrolled. The student's primary field of emphasis.

Major Degree Field — A discipline division or discipline specialty in which a degree is offered.

Major Field of Study — See Major.

Marital Status — The legal character or condition of an individual with respect to wedlock. See the NCHEMS (WICHE-PMS) *Data Elements Dictionary: Students* for relevant categories. For purposes of these manuals, married includes only those people who are married and residing together (i.e., not divorced or separated).

Mechanical Area — That portion of the gross area of a building designed to house mechanical equipment, utility services, and public toilet facilities required to provide utility services to a faculty or building.

Merchandising Facility — A room (or group of rooms) used to sell products or services.

This category includes such rooms as bookstores, barber shops, post offices, dairy stores, student union "desks," and motel-hotel rooms.

Merchandising Facility Service Space — A room which directly serves a merchandising facility as an extension of the activities in that room.

Included in this category are rooms generally referred to as supply closets, sorting rooms, freezers, telephone rooms, linen rooms, laundry rooms, valet service, and private toilets.

Miscellaneous General Use and Special Use Facilities — See Other Special Use and General Use Facilities.

Multiple-Family Dwelling Facility — A duplex house, apartment building, or other multiple-unit dwelling for more than one family. This category includes student and faculty apartment buildings and duplex houses rented to staff and/or students.

Nonacademic Departments — See Administrative Departments.

Nonacademic Professionals — Employees working in nonacademic departments, who are engaged in activities which require specialized and advanced training.

Nonclass Laboratory Facility — A room used for laboratory applications, research, and/or training in research methodology which requires special purpose equipment for staff and/or student experimentation or observation.

Included in this category are rooms generally referred to as research laboratories and research laboratory offices.

Excluded from this category are Class Laboratories, Special Class Laboratories, and Individual Study Laboratories.

Nonclass Laboratory Facility Service Space — A room which directly serves a nonclass laboratory facility as an extension of the activities in such a facility.

Included in this category are balance rooms, cold rooms, stock rooms, dark rooms, animal rooms, greenhouses, etc., which serve nonclass laboratory facilities.

Objectives — Specific ends to be achieved in the functional area of the goal which the objective is designed to support. Objectives are stated in quantitative terms. Once adopted, they connote intent and presume that courses of action will be undertaken to achieve that intent. (See Goals.)

Occupancy Rate — The quotient obtained by dividing the number of occupants of a facility by the design capacity of the facility (normally used in reference to residential facilities and health care facilities).

Office and Office-Related Facility — Comprises all spaces which are related to offices such as offices, office service rooms, conference rooms, and conference service rooms. Includes office facilities, office facility service space, conference facilities, and conference facility service space.

Office Facility — A room used by faculty, student, or staff working at a desk (or table).

Included in this category are rooms generally referred to as faculty offices, administrative offices, clerical offices, graduate assistant offices, teaching assistant offices, student offices, etc. Also included in this category is a studio (music, art, etc.) if such a room serves as an office for a staff member. A studio intended to serve a group of students is classified as "Class Laboratory." An office typically is equipped with one or more desks, chairs, tables, bookcases, and/or filing cabinets.

Office Facility Service Space — A room which directly serves an office facility (or group of office facilities) as an extension of the activities in such a facility.

Included in this category are file rooms, mimeograph rooms, vaults, waiting rooms, interview rooms, closets, private toilets, records rooms, and office supply rooms. Centralized mimeograph and printing shops which are campuswide in scope should be classified as "Shop Facilities."

Office Landscaping — A design technique for office space which is intended to provide flexible office spaces by omitting partitioning. Visual privacy is obtained through the strategic arrangement of furniture such as bookcases, room dividers, and planters.

One-Family Dwelling Facility — A house provided for one family.

This category includes houses provided for, or rented to, staff and/or students.

Open Stack — A library stack area which is freely open and accessible to library users without restriction.

Open-Stack Reading Room — A room which is a combination of study room and stack, generally without boundaries between the stack areas and the study areas.

Operating Days — The number of days per year that a facility (e.g., residence hall, dining facility, infirmary) is available for use.

Organized Research Program — A primary program in the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of those research-related program elements established within the institution under the terms of agreement with agencies external to the institutions or separately budgeted and conducted with internal funds.

Other Special Use and General Use Facilities — Includes assembly facilities; armory, clinic, and demonstration facilities; and field-service facilities.

Other Student Service Facilities — Includes the following room types: lounge facility, lounge facility service space, recreation facility, recreation facility service space, merchandising facility, merchandising facility service space.

Out-Patient — A person receiving treatment at a hospital, but not confined to an overnight stay at that hospital. (See In-Patient.)

Out-Patient Visit — A single visit to a hospital or infirmary by an individual for the purposes of receiving treatment as an out-patient.

Part-Time — For the purposes of these manuals, activities or load which fall below the standard for a full-time commitment to work or study within the organized programs of the institution. (See Full-Time.)

Patient Bed-Day Capacity — The product obtained by multiplying the number of available hospital or infirmary beds by the number of days per year that the hospital or infirmary will be available for use (365 in instances of year-round operation and a lesser number when the facility is closed for summer months and/or other vacation periods).

Personnel Inventory — A tabulation of all personnel at the institution. The Fair Labor Standards Act may be used to define the most commonly used categories. (See NCHEMS (WICHE-PMS) *Higher Education Faculty and Staff Assignment Classification Manual.*)

Physical Education Classes — Formally organized, scheduled physical education instruction activities. As used in *Higher Education Facilities Planning and Management Manuals,* Physical Education Classes represent one of the four categories of activities commonly conducted in Athletic/Physical Education facilities. (See Intramural Athletics, Intercollegiate Athletics, and Free-Time Recreational Activities.)

Physical Plant Facility — Facilities required for physical plant maintenance, operations, and construction activities.

Includes the following room types: shop facilities, shop facilities service, storage facilities, storage facilities service, vehicle storage, vehicle storage service.

Place of Residence — For purposes of these manuals, the recognized designation of domicile where an individual may be found or reached or has the legal connection of resident.

Professional Personnel Category — For the purposes of these manuals, the institutional classification of professional employment positions.

Program — For the purposes of these manuals, a set of activities which, operating collectively, achieve a well-defined objective or set of objectives of the organization within a specified time frame. These activities may be described in terms of the resources, technologies, and policies which, through their integrated operation, produce goods or services which are of value to the organization because they contribute to the achievement of the objective or set of objectives.

Program Analysis — The investigation of the historical relationships between selected variables or phenomena (e.g., the relationship between Weekly Student Hours and Weekly Faculty Contact Hours). As used in these manuals, Program Analysis is restricted to the investigation of those relationships which are particularly relevant to the Program Planning process.

Program Classification Structure (PCS) — A standard categorization of activities in higher education developed to be used as a standard format for developing institutional program budgets. A project within the NCHEMS (WICHE-PMS) Program. These manuals utilize the preliminary edition of the *Program Classification Structure* published in July 1970.

Program Data — Data regarding such things as courses, students, and instructional loads which must be available before the facilities planning procedures can be implemented. These data are derived through use of Program Planning procedures such as those presented in Manual Six.

Program Definition — The development of a proposed set of courses of action (the means) by which the desired ends (objectives) can be achieved. As related to the comprehensive planning process, program definition involves the development of a comprehensive set of planning assumptions and guidelines upon which projections are based.

Program Element — The lowest level of disaggregation in the *Program Classification Structure* hierarchy. The program element represents the smallest unique collection of resources that are output-producing activities (i.e., a collection of resources, technologies, and policies which, through their integrated operation, produce goods and services that are of value to the organization because they contribute to the achievement of one or more institutional objectives).

Program Planning — The process by which those data necessary to estimate the amounts of resources required to implement a course of action (a program) are derived. The application of the set of planning assumptions in order to calculate those factors which can be converted into terms of resource requirements. The estimation of such things as instructional loads to be placed on each of the academic departments, the number of each type of staff required to carry out the programs, distributions of classroom Section Sizes, etc.

Public Service Faculty — Faculty employees of the institution assigned to activities within the Public Service Program.

Public Service Program — A primary program within the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of those program elements within the institution which provide outputs directed toward the benefit of the community or individuals residing within the geographic service area of the institution.

Recreation Facility — A room or rooms which are used by students, staff, and/or the public for recreational purposes.

This category includes such rooms as bowling alleys, pool and billiards rooms, ping-pong rooms, ballrooms, chess rooms, card-playing rooms, (noninstructional) music listening rooms, and hobby rooms.

Recreation Facility Service Space — A room which directly serves a recreation facility as an extension of the activities of such a facility such as locker rooms, equipment rooms, or shower rooms.

Research Facility — For the purpose of these manuals, a facility which houses investigative or scholarly activities. (See Nonclass Laboratory Facility, Office Facility, and Organized Research Program.)

Research Faculty — Faculty employees of the institution assigned to activities within the Organized Research Program.

Room — A walled or partitioned portion of space within a building or other structure.

Room Types — Categories of rooms in accordance with the Higher Education General Information Survey facilities classification system. For the complete classification system see the *Higher Education Facilities Classification and Inventory Procedures Manual.*

Room Utilization Rate (RUR) — The number of hours per week a room is scheduled for use.

As a matter of convention the term Room Utilization Rate is used in conjunction with classrooms (or class laboratories) with the same range of Station Counts and of the same Classroom or Class Laboratory Type.

Schedule of Courses — A publication or compilation containing information about the courses to be offered during a given term including such information as place of meeting, days and hours of meeting, and course credit value.

Section — A group of students assembled for instruction in a regularly scheduled meeting of a course.

Section Size (SS) — The number of individuals enrolled in (assigned to) a Section of a scheduled or organized course.

Service Space Serving Hours — The number of hours during which a specific meal is served.

Shop Facility — A room used for the manufacture or maintenance of products and equipment.

This category includes such rooms as carpenter shops, plumbing shops, electrical shops, painting shops, and similar physical plant maintenance facilities. It also includes central printing and duplicating shops, central receiving, and central stores. Not included are shops used as class laboratory facilities for teaching purposes.

Shop Facility Service Space — A room which directly serves a shop facility as an extension of the activities of such a facility.

Included in this category are tool supply and/or storage rooms, materials storage rooms, and similar equipment or material supply and/or storage rooms. Locker rooms, shower rooms, lunch rooms, and similar nonpublic areas should be included.

Site Planning — The process by which the map of an institution's campus is revised to reflect the appearance of projected new buildings, other physical facilities and landscaping, and the disappearance of any buildings scheduled for demolition. The process of determining the locations for buildings and other facilities taking into consideration such things as functional relationships with other facilities, vehicular and pedestrian traffic flow, utilities requirements, and locations, aesthetics, etc.

Size of Department — See Department Size.

Space Factor — See General Planning Criteria.

Space Management — The process by which existing facilities are allocated to current programs (or organizational units), usually through application of detailed planning and programming methodologies.

Special Class Laboratory Facility — A room used by informally, irregularly scheduled classes which require special-purpose equipment for student participation, experimentation, observation, or practice in a field of study.

A Special Class Laboratory is designed and/or furnished with specialized equipment to serve the needs of a particular area of study for group instruction in informally (or irregularly) scheduled classes. The design and/or equipment in such a room normally precludes its use for other areas of study. Special class laboratories typically (but not necessarily or exclusively) include such rooms as language laboratories, (group) music practice rooms, and (group) studios. Does not include Class Laboratories, Individual Study Laboratories, or Nonclass Laboratories.

Special Class Laboratory Facility Service Space — A room which directly serves a special class laboratory facility as an extension of the activities in such a facility (e.g., type storage, equipment storage, and stock rooms).

Stack Space — A room (or portion of a room) used to provide shelving for library or audio/visual materials.

Staff in Academic Departments — All employees assigned to academic departments. For purposes of the *Higher Education Facilities Planning and Management Manuals,* the term academic departments is used to denote all organizational units of an institution of higher education which house the Instruction, Research, and Public Service programs of the institution. The term is used in the broadest sense and is used to distinguish such organizational units from administrative departments (i.e., those organizational units which provide support service to the academic departments, students, or to the institution as a whole).

Staff Level — The categorization by institutional standards of employees by a number of variables such as skill level, proficiency, length of service, or responsibility.

Station — The total facilities necessary to accommodate one person for one time period. The time period varies for different types of facilities. For example, when discussing classroom Stations, the period of time may be one hour or class period, and when dealing with office Stations the time period may be one year (or it may be indefinite).

Station Count (SC) — The number of Stations in a room.

Station Occupancy Ratio (SOR) — The proportion of Stations used when the room is scheduled for use.

As a matter of convention, the term Station Occupancy Ratio is used in conjunction with classrooms (or class laboratories) with the same Station Count and of the same type.

$$\text{SOR} = \frac{(\text{WSH per Station})}{(\text{WRH per Room})}$$

$$= \frac{(\text{Station Utilization Rate})}{(\text{Room Utilization Rate})}$$

$$= \frac{(\text{SUR})}{(\text{RUR})}$$

Station Utilization Rate (SUR) — The number of hours per week a Station is scheduled for use.

As a matter of convention, the term Station Utilization Rate is used in conjunction with classrooms or class laboratories with the same Station Count and of the same type.

$$\text{SUR} = \frac{(\text{Scheduled WSH})}{(\text{Number of Stations})}$$

also

$$\text{SUR} = \begin{array}{l}(\text{Room Utilization Rate}) \times \\ (\text{Station Occupancy Ratio})\end{array}$$

$$\text{SUR} = (\text{RUR}) \times (\text{SOR})$$

Storage Facility — A room used to store materials.

Classification of a room as a Storage Facility is limited by definition to a central storage facility (warehouse) and inactive departmental storage. Storage related to other types of space follow the classification of that type of space with a "service" designation. The distinction between "service" and "storage" rests on the possibility of physical separation of the materials stored. If the material being stored could be placed in a warehouse, implying only occasional demand for the materials, then "Storage Facility" is the appropriate classification. Storage which must, by the nature of the materials stored and the demands placed upon them by the program, be close at hand should be classified according to the appropriate "Service" category.

Storage Facility Service Space — A room which directly serves a storage facility.

Student Credit Hours (SCH) — A unit of measure which represents one student engaged in an activity for which one hour of credit toward a degree or other certificate will be granted upon successful completion. Total Student Credit Hours for a course are calculated by multiplying the course credit hour value by the number of students enrolled in the course.

Student Credit Hour of "Other" Instruction — A unit of measure which represents one student engaged in an informally scheduled activity for which one hour of credit will be granted upon successful completion. Examples of informally scheduled activities are independent study and thesis work.

Student Body — The totality of all individuals who are enrolled in one or more courses offered by the institution.

Student Health Facility — See Health Facility.

Student Level — The categorization by institutional standards of the students' progress toward a specific degree or certificate. See NCHEMS (WICHE-PMS) *Data Element Dictionary: Students* for relevant categories.

Student Major — The student's primary field of emphasis. The field of concentration may fall within a single department of instruction or may overlap several departments (AACRAO definition).

Student Service Program — A support program within the NCHEMS (WICHE-PMS) *Program Classification Structure* consisting of those program elements related to the institution's student body, excluding the degree-related curriculum and student records.

Student Station Period Occupied — See Station Occupancy Ratio (SOR).

Student Station Period Use — See Station Utilization Rate (SUR).

Study Facility — A room used to study books or audio/visual materials on an individual basis.

Study Facility Service Space — A room which directly serves a study facility, stack, open-stack reading room, or library processing room as a direct extension of the activities in such a facility.

Subpopulation — A subgroup of the student body, the members of which have a specified characteristic in common.

Support Employees — See Support Staff.

Support Staff — For purposes of these manuals, all employees in nonacademic departments and all employees in academic departments except faculty members and research and public service professionals who have the equivalent of faculty appointments.

Turnover — The number of times a typical Station can be used during a specified period of time.

The average number of times that a typical dining Station can be used during the course of serving a particular meal. The ratio between the number of diners that can be accommodated in a facility for a single meal and the number of dining Stations available in that facility. Also calculated by dividing the length of the serving period for the meal by the shortest comfortable (or average) eating time for that meal.

Type of Instruction — See Instruction Type.

Type of Occupant — One possible parameter on which office assignments are based. The title, position, or rank of persons requiring office space which in terms of institutional policy are used to differentiate between amounts and types of office space assigned.

Types of Rooms — See Room Types.

Unassigned Space — Facilities which are not assigned to or are not available to any institutional unit (or noninstitutional agency) at the time of the facilities inventory. The categories of unassigned space are inactive space, unfinished space, and space which is in the process of alteration or conversion.

Unfinished Space — Rooms or other assignable floor areas in new buildings, in buildings being remodeled, or in new additions to existing buildings which are unfinished at the time of the facilities inventory.

Unit Floor Area — Assignable Square Feet of space required per unit of space demand.

Unit Floor Area Criteria — The quantitative value associated with the number of Assignable Square Feet required per unit of space demand (Station, occupant, FTE, etc.) for various types of facilities.

Upperclass — As used in these manuals, a student who has completed a year of work at an institution of higher education, but who has not completed the requirements for a first earned degree (i.e., for an associate or bachelor's degree).

Utilization Assumptions Required — A listing of various assumptions regarding utilization or occupancy rates which must be expressed quantitatively prior to application of the methodologies contained in these manuals. These assumptions, expressed in quantitative terms, define institutional policies for the facilities planning process.

Utilization Criteria — Quantitative values associated with utilization assumptions.

Vehicle Storage Facility — A room (or structure) which is used to store vehicles.

This category includes rooms (or structures) generally referred to as garages, boat houses, airplane hangars, and other storage areas for vehicles (broadly defined). Uncovered exterior parking areas are excluded.

Vehicle Storage Facility Service Area — A room (or structure) used to service vehicles. This category includes any area associated with a vehicle storage facility which is used for the maintenance and repair of automotive equipment, boats, airplanes, and similar vehicles.

Veterinary Hospital/Animal Care Facility—A room which provides a cage or stall for animal patients.

This category includes rooms generally referred to as animal rooms, stalls, wards, and similar rooms.

Veterinary Hospital/Animal Care Facility Service Space — A room which serves an animal care facility as a direct extension of the activities in such a facility.

Veterinary Hospital/Clinic Facility — A room used for the medical examination and/or treatment of animals as inpatients or out-patients.

This category includes rooms generally referred to as examination rooms, surgery rooms, x-ray rooms, and similar facilities which are (or may be) used in the examination and/or treatment of several patients within the course of a day.

Veterinary Hospital/Clinic Facility Service Space — A room which serves a clinic facility as a direct extension of the activities in such a facility.

This category includes rooms generally referred to as clinical laboratories, pharmacy, radium storage, scrub-up rooms, and animal rooms used for diagnostic purposes.

Volume—A physical unit of any printed, typewritten, handwritten, mimeographed, or processed work contained in one binding or portfolio, hardbound or paper bound, which has been classified, cataloged, and/or made ready for use, including bound periodical volumes.

Weekly Contact Hours — The total number of hours per week per student a course is scheduled to meet. Since this term refers only to scheduled meetings, no Weekly Contact Hour values are attached to such unscheduled activities as independent study and thesis work.

Weekly Contact Hours of Classroom Instruction — With regard to a single course, the number of hours per week per student the course is scheduled to meet in classroom facilities (lecture rooms, recitation/discussion rooms, seminar rooms).

Weekly Contact Hours of Laboratory Instruction — With regard to a single course, the number of hours per week per student the course is scheduled to meet in laboratory facilities.

Weekly Faculty Contact Hours — The number of hours spent by instructional staff members in contact with scheduled Sections in one week. (Usually but not necessarily equal to Weekly Contact Hours.)

Weekly Room Hours (WRH) — The number of hours per week a room is used for scheduled activities required for the courses in the schedule of courses. (Frequently but not necessarily equal to Weekly Contact Hours.)

Weekly Room Hours Capacity (WRH_c) — The number of Weekly Room Hours (WRH) that can be accommodated in rooms of each Station Count. The product of the number of Rooms (R) of each Station Count and the Room Utilization Rate (RUR) for that Station Count assumed for planning purposes.

$$(WRH_c) = (R) \times (RUR)$$

Weekly Student Contact Hour— See Weekly Student Hour.

Weekly Student Hour (WSH) — A unit of measure which represents one hour of instruction given to one student in one week.

Weekly Student Hour Capacity (WSH_c) — The number of Weekly Student Hours (WSH) that can be accommodated in Rooms of each Station Count. The product of the Number of Stations (N) in Rooms of each Station Count and the Station Utilization Rate (SUR) assumed for planning purposes for that Station Count.

$$(WSH_c) = (N) \times (SUR)$$

Weekly Student Hour of Classroom Instruction — A unit of measure which represents one hour of instruction given to one student in one week in classroom facilities (lecture rooms, recitation/discussion rooms, seminar rooms, etc.).

Weekly Student Hour of Laboratory Instruction — A unit of measure which represents one hour of instruction given to one student in one week in class laboratory facilities.

Weekly User Hours — A unit of measure which represents one hour of activity engaged in by one individual for one hour during a week. In the *Higher Education Facilities Planning and Management Manuals,* Weekly User Hours is used in place of the more common term Weekly Student Hours whenever the users of the facilities are not strictly students. The term Weekly User Hour is used primarily with regard to Athletic/Physical Education facilities where faculty, staff, and residents of the surrounding community as well as students may be users of the facilities.

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